

Vermont's Dairy Farm - Solar Power Initiative



A Report on H.518

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Introduction

In the face of global warming, the United States is charged with the immense task of re-thinking and re-designing the way in which energy is produced and consumed. As the nation grapples with the consequences of a changing climate, policymakers are drafting legislation to promote the development of renewable energy production. Specifically in regards to the electricity sector, which heavily contributes to America's carbon footprint, both the federal and state governments are creating programs that connect electricity powered by renewables such as solar, wind, hydroelectric, and geothermal to the grid. The political landscape of the current federal government is one of stalemate and conflict. Due to the position the federal government finds itself in with regards to climate legislation, the states have taken it upon themselves to be arenas for experimentation with renewable energy.

Many states have implemented Renewable Portfolio Standards (RPS) that mandate a certain percentage of electricity to come from a renewable source (USEPA 2010). In order to meet these standards, some states are looking toward the Feed-in-Tariff model (FIT). Feed-in-Tariffs increase the flow of renewable energy to the grid as well as improve grid parity by requiring a utility to purchase a certain amount of electricity from renewable sources. The utility buys the electricity at a premium rate from the producer, which in turn encourages further development of renewables (Farrell 2009). The FIT model promotes the installation of large-scale renewable energy projects, and thus it possesses great potential for states to meet RPS targets.

Feed-in-Tariffs in Vermont

Vermont is leading the way in the development and implementation of the FIT system in the United States. In 2005, Vermont Governor Jim Douglas signed into law the Sustainably Priced Energy Development Program (SPEED), which in May of 2009 was significantly amended to include a FIT program in which developers apply to partake in a lottery to secure funding for a project (Vermont Public Service Board 2010). The SPEED program is administered by the Vermont Public Service Board (VPSB), and calls for projects of 2.2MW or less with a total program cap of 50MW. Solar, wind, hydroelectric, landfill gas, farm methane, wind, and biomass are eligible technologies to receive standard offer rates. The number of applicants that entered the lottery far exceeded the program's capacity, prompting the legislature to consider adding an additional 50MW to the program.

Currently, there is a proposed bill in the Legislature titled "Dairy Farm – Solar Power Initiative" (H.518) that seeks to base a new program designed specifically for dairy farmers off of the current FIT program outlined in SPEED. Dairy is an economically vital industry for Vermont, but due to declining milk prices it has been a struggle to keep farmers on the land. By expanding on the current FIT system, H.518 has the potential to fulfill two goals of the Legislature at once by offering a program that will simultaneously grow Vermont's solar industry and aid the struggling dairy industry.

H.518: A Look at the Proposed Bill

(Vermont State Legislature 2009)

- Total program cap: 50 MW of solar energy on dairy farms
- Individual plant cap: 2.2 MW
- Standard offer term: 10-25 years
- The plant cannot be located on primary agricultural soils.
- The plant can be operated by another party only if the dairy farmer him- or herself receives some sort of income from the arrangement (i.e, from a lease).
- Solar development on dairy farms is exempt from the definition of “development” in Act 250, thus allowing dairy farm land with solar development to remain in the Current Use program.
- Farms are granted aid competitively in response to proposals. The VPSB may pick farms based on factors like plant capacity, use of innovative technology, geographic diversity, or proximity to the utility grid. These factors are as of yet undecided.
- Each January 15th (annually), progress toward the 50MW target will be assessed. Based on progress, the subsidy program will also be reassessed, and barriers to progress will be identified.
- If enrolled in this program, farmers are not eligible for funds from the Clean Energy Development Fund.

Scope of Project

We worked in conjunction with two of the bill’s sponsors Tim Jerman (D - Essex) from the House Natural Resources and Energy Committee and Will Stevens (I - Shoreham) of the House Agriculture Committee. The question we set out to answer was whether or not H.518 is both feasible and desired. Our goal was to interview farmers, solar developers, dairy economists, government officials, program coordinators, and other interested stakeholders across the state to identify key concerns and recommendations for H.518. We identify and synthesize these ideas in order to recommend language that needs to be added or removed from the current bill.

The following sections lay out the concerns of farmers, developers, and the general public, which are then broken down into key issues that are discussed in further detail. These key issues are classified as economic and political issues, personal issues, and physical considerations. By weaving

together the concerns and recommendations of all parties involved, we identify our own recommendations for the bill. Our hope is that we can provide our partners in the Legislature with the insight needed to direct the bill's further development so that it can both pass into law and be successfully implemented.

Procedure

Farmers:

In order to gather information from farmers, we began by interviewing a small base of dairy farmers that members of our group had previously made contact with through other Middlebury classes. By visiting these farms we were able to gain a basic understanding of the general concerns of farmers. These conversations were used to identify what questions were most important to ask in our shorter interviews that followed (Appendix D-2 for interview guide). The 2009 Dairy of Distinction list provided by the Northeast Dairy Farm Beautification Program was used to gather a statewide sample of farmer concerns and recommendations surrounding the bill. After eliminating the 55 farms that we could not secure phone numbers for, we communicated with 20 farms and left messages for 29 (Appendix D-2 and D-3).

Developers:

In order to gather information from developers, we used the existing SPEED lottery list to identify possible contacts. The in-depth interview guide for developers (Appendix B) was based off of our initial background research. We conducted phone interviews with four developers located within the New England region.

Other Stakeholders:

Throughout our conversations with farmers and developers, we concluded that in order to completely understand the issues with the bill we needed to expand our reach to additional interested parties. We contacted University of Vermont dairy economist Bob Parsons, Addison County Senator Claire Ayer, Dennis Shaffer from the Vermont Land Trust, and Martin Bowen from Central Vermont Public Service. Additionally, we spoke with Paul Stone, a Vermont poultry farmer to see if this program should possibly expand to include all farms and not be limited to dairy (Appendix C-5). In order to gather information from the general public, we administered 26 surveys (Appendix D-1) at the Addison County Green Energy Expo on March 13th, 2010, at the Middlebury Union High School.

Case Study:

In an effort to flesh out the current language in the bill, we conducted a conference call between Encore Redevelopment and Crawford Family Farm. This case study provided us with an in-depth look at how the bill as it stands could potentially work on the ground.

Concerns of Dairy Farmers

According to our phone and personal interviews, Vermont dairy farmers have mixed reviews of H.518 as it stands. What some farmers see as attractive components of the bill may be potentially negative to other farmers. Despite these varied opinions, the majority of dairy farmers would be willing to participate in the bill; only three of twenty farmers said they would not participate (Table 1). Overall, farmers are excited about the opportunity to diversify their income, but are concerned about how the economics would work out and how their farm operation might be affected in various ways (Tables 2 and 3). The main points of contingency for farmers include:

- Aesthetics
- Grid connection and infrastructure
- Loss of viable land
- Farmer-developer relationship
- Differing development potential
- Conflicts with other programs

Although the aesthetics of renewable energy infrastructure, such as wind turbines, have often been an issue in public support for wind technology, solar panels may present less of an issue. Only two farmers mentioned aesthetics, one of which said that although solar panels might impact the land appearance, it could be positive for marketing. However, the second farmer was adamantly concerned about the negative impact of solar panels on the Vermont landscape (Monument Farms Dairy, Appendix A-4).

Grid connection was regarded ambiguously among farmers, while infrastructure was cited as a strict con of the program (Tables 2 and 3). Solar panels must be connected to the electrical grid and often require a three-phase connection. Where only one-phase is available, three-phase would have to be installed. Such an endeavor can be expensive and can also interfere with harvest if electrical lines cut through agriculture land. Infrastructure, on the other hand, was perceived to be a downfall of solar development on farms. Depending on the site, solar development infrastructure on a farm may include an access road and/or electrical poles and lines connecting solar panels to the grid. This could potentially lead to loss of viable land.

Losing viable crop or grazing land is a major concern for farmers (Tables 2 and 3). In many cases, dairy farmers do not have unused land for solar development and need all of the land they own to feed their cows. Thus, giving up this land to solar development might mean that farmers must buy feed elsewhere. This can be expensive for the farmer and is not environmentally friendly due to the costs of shipping feed long distances. Loss of viable land could also affect farm size as a reduction in the number of cows may be necessary due to subsequent changes in land-use for solar development. These factors could lead to perhaps the most important concern - loss of farmer identity as they may no longer feel that they are farmers first, but rather electricity developers (Crawford Family Farm, Appendix A-3).

Another area of concern was the farmer-developer relationship (Table 3). Through this program, farmers may choose to develop solar themselves or to enter into a lease relationship

with a solar developer (Table 4). In many cases farmers may choose to develop solar themselves to have more control over maintenance and to ensure the privacy of their land. Farmers who choose to enter into a salary share or lease agreement with a developer are therefore concerned about the general respect from developers for their farm land (Monument Farms Dairy, Appendix A-4). Farmers also stated concern about the level of experience that the developers have with larger solar projects and would feel more comfortable entering into a partnership with reputable developers.

The bill's support of solar technology could be beneficial for some farmers while constricting for others due to differences in solar potential on farm sites, especially in comparison with other renewable technologies. Farmers' preferences for particular technologies also differ (Table 5). For instance, several farmers indicated that they had previously consulted energy developers and found that their lands were best suited for wind development. However, others said that wind was not an option for them (Blue Spruce Farm, Appendix A-2; Blue Ledge Farm, Appendix A-5).

Conflicts between the program proposed by H.518 and other programs could also lead to differential eligibility among farms (Table 6). The development of land for commercial energy production, as advocated by H.518, may conflict with the land-use mandates of state-sponsored and other conservation programs for farmers. Of the twenty farmers interviewed, nine are not involved in other programs. Several are involved in Current Use, have conservation easements held by the Vermont Land Trust or have sold their development rights elsewhere. Fortunately, the development of solar is exempt from "development" as defined by Current Use. However, commercial energy development is prohibited by the Vermont Land Trust as fifty percent or more of electricity must be used on-site. No conflict exists between the H.518 program and the Conservation Reserve Program because it conserves riparian buffers, which are unsuitable for solar development.

Tables

Table 1. Responses from farmers when asked if they would be likely to participate in the program assuming that the farmer's top concerns were met. See Appendix E-2 for farm names corresponding with numbers.

Farmer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Yes	X			X	X	X	X	X		X	X	X	X	X	X	X		X	X	X
No		X	X														X			

Table 2. Responses from farmers when asked to list the pros/cons of the Dairy Farm-Solar Power standard offer program as proposed. P stands for pro, C for con.

Farmer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Aesthetics												C/P								C
Grid connection	C		P							C										
Infrastructure	C						C		C		C	C		C				C		C
Maintenance needs										P	C	P		C	C			C		P
Buying feed								C					C							
Use valueless land	C			C				P		P										P
Give up viable land								C	C	C	C	C	C	C			C			
Diversifying income	P			P		P						P	P					P		
Environmental benefits																P				P

Table 3. Responses from farmers when asked what elements would have to be incorporated into the initiative in order for the farmer to participate. Farmers stated what existing or potential aspects of the program would make them most likely to participate.

Farmer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Proper economics	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Keep size of farm													X							
Not buying feed													X							
Good farmer-developer relationship						X		X				X		X						X
Rooftop panels					X		X				X			X						

Table 4. Responses from farmers when asked in what way they would want to participate in the proposed program. Farmers state whether they would be likely to act as a leaser, entering into an agreement with a solar developer, or a developer, producing the solar electricity themselves. Uncertainty was noted as "not sure."

Farmer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Leaser			X	X	X	X	X	X	X	X		X			X	X		X		
Developer				X	X			X	X				X			X			X	X
Not Sure	X																			

Table 5. Responses from farmers when asked what other energy production technology they would be interested in developing on their farms.

Farmer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Wind	X			X	X			X	X				X		X	X	X	X	X	
Solar			X		X	X	X						X						X	X
Thermal														X					X	
Wood											X									
Methane		X		X	X		X			X			X							X
Small-scale hydro				X															X	

Table 6. Farmer participation in other programs. These programs were selected when a farmer mentioned them. Other farmers across the state may be involved in other programs, such as the Conservation Reserve Program.

Farmer	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Land Trust			X								X					X	X			X
SPEED																				X
Current Use									X			X					X			
Sold development rights	X																			X
No programs		X			X		X	X		X			X		X			X	X	

Concerns of Developers

The target solar developers of the Dairy Farm - Solar Power Initiative, largely consisting of Vermont real estate firms, have shown clear interest in the subsidies established in the SPEED program. However, developers have cited consistent obstacles in the way of developing renewable energy generation projects in Vermont and foresee further obstacles in the way of solar development projects on dairy farms due to the following factors:

- Permitting Process
- Tax Break
- 2.2 MW Cap

In Vermont, energy generation facilities are required to address their potential environmental impacts. Developers believe that the permitting process, designed to address the substantial land impacts of conventional energy generation technologies, is unnecessarily rigorous for solar development projects. Many facets of this permitting process do not seem to have any relation to the potential impacts of solar development. This is understandable as the land impacts of solar generation projects are not comparable to that of more conventional energy generation.

The permitting process has proven to be a significant cost for solar developers and has delayed projects by as much as six months. As H.518 has already taken steps to augment the language of the SPEED program to address the unique nature of solar development, such as disqualifying solar development as a form of conventional “development,” we suggest that it might be advisable to tailor some facets of the permitting process to the specific nature of solar development as well.

The 30% solar development state tax break is larger than the tax burden of our target solar developers. This issue is exacerbated because the potentially larger out-of-state developers do not qualify for this tax break. Therefore, because the tax break is not in proportion to the tax demand of solar developers, the overall effective subsidy is significantly decreased. Many developers have attempted to reclaim the full-intended subsidy by entering into a financial relationship with a tax equity partner, a company with a sufficiently large tax burden to benefit from the large tax break. Developers have suggested that an easier way to address this issue is to sell the tax break to another company, as opposed to entering into a more intimate financial relationship, a process which is presumably permissible in other states but not in Vermont. With recommendations from Nick Muller, Middlebury College Assistant Professor of Economics, we researched the potential of solar developers to establish a financial relationship with Vermont venture capital firms (Muller, personal communication). We found that venture capital firms do not consider solar development to be a secure investment.

Plants with capacities that exceed 2.2 MW have the potential to yield higher returns and offset the high costs of solar development. As it stands, the 240 kW net metering sites are more attractive to developers because the costs are lower and the 2.2 MW site is not lucrative enough to entice developers to take the higher risk that comes with larger investments. Developers feel that legislation capping solar production plants at 2.2 MW is not conducive to making renewable energy a substantial portion of the state’s energy portfolio.

Concerns of General Public

At the Middlebury Green Energy Expo hosted on March 13, 2010, we distributed surveys to the general public in order to gain an understanding of overall receptiveness to H.518. Survey participants included members of Addison County and the surrounding area as well as solar developers and farmers. The survey first introduced the bill and then asked participants to rank various social and economic issues on a scale from 1 to 5, indicating the magnitude of influence they perceived the issue to have on the passage of H.518 (for this description, see Appendix D-1). An issue ranked 1 has the least impact on the success of the bill, and an issue ranked 5 has the greatest.

Concerns regarding aesthetics had the lowest median response value out of all 10 issues listed (Figure 1). Participants thought that both financial incentives for the land owner and solar developers (Issue 3 and 4) and the possible disqualification of some farmers due to participation in other existing programs (Issue 7) would have the greatest impact on the success of H.518, with median scores ranging from 4.5 to 5. The rest of the issues presented received median scores of 4.

At the end of the survey, participants were asked whether or not they would support the passage of H.518. The majority showed clear support for the bill, while approximately one fourth of the total participants were uncertain (Figure 2). Only one participant did not support H.518.

"[This bill] needs to include all types of farms, not just dairy farms."
– Orchardist, may support H.518

"[I'm] not sure about using arable land for energy production, why not on a roof?"
– Participant, may support H.518

"We need renewables to displace Vermont Yankee and continue the agriculture-renewable [energy] connection."
– Participant, in support of H.518

"It would create good jobs and make our energy production independent, self-reliant and stable."
– Developer, in support of H.518

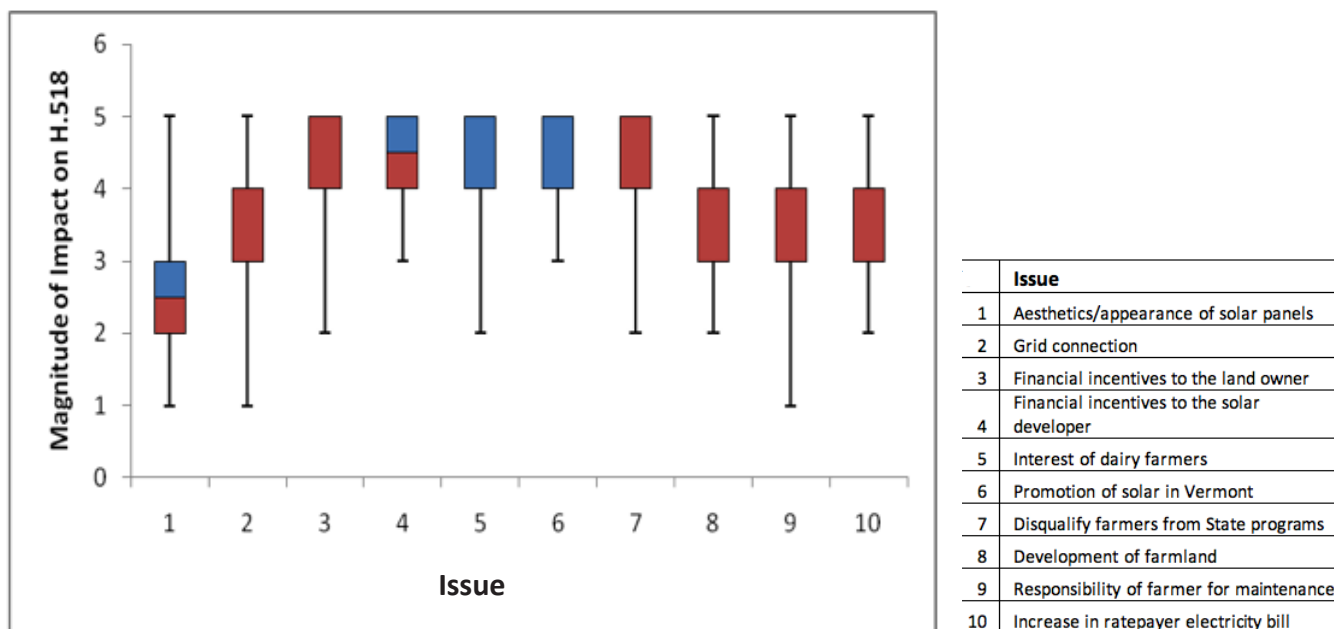


Figure 1. The perceived magnitude of impact of issues 1-10 on the success of bill H.518. The line between the two boxes represents the median value of responses, while the upper and lower boundaries of the box represent the 75th and 25th percentile value respectively. Red boxes mark the range from the 25th percentile value to the median and the blue boxes mark the spread from the median to the 75th percentile. Error bars denote the minimum and maximum values. These values are based on 26 survey responses taken at the Middlebury Green Energy Expo. Issues 1-10 are listed according to reference number in the table to the right of the graph.

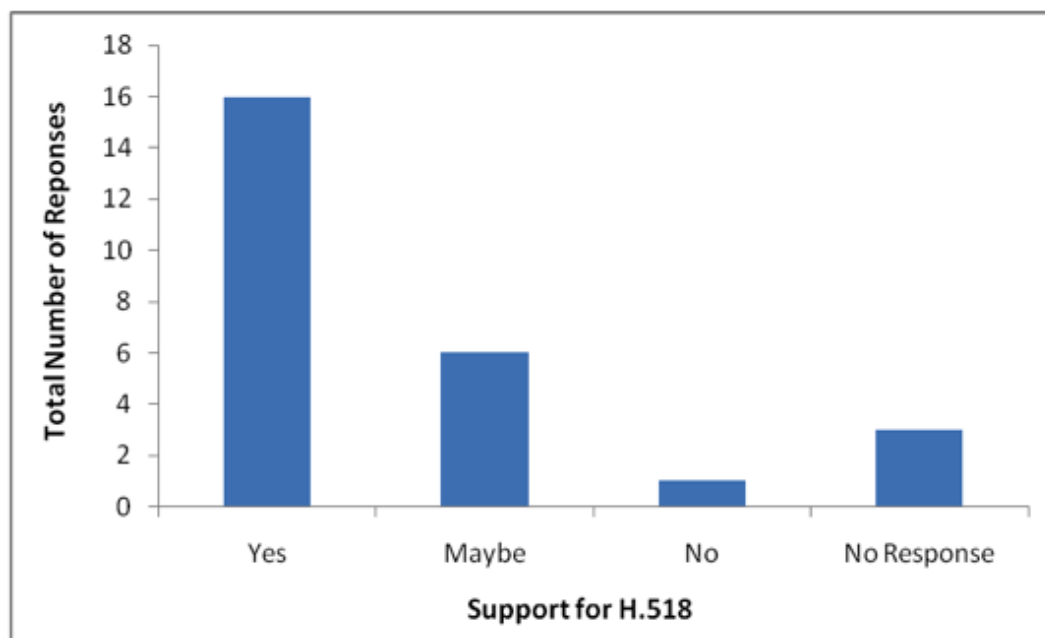


Figure 2. Responses of survey participants when asked if they would support the passage of H.518.

Agriculture and Renewable Energy Development:

A Look at New York State's Dairy Hills Wind Farm Project

Vermont's proposed Dairy Farm–Solar Power Initiative is unique, and to this date no similar project has been attempted. However, in order to make this bill a reality, it is beneficial to explore how other states are promoting the development of renewable energy on or near agricultural land. In 2005, a private entity, Horizon Wind Energy (HWE) proposed to develop wind turbines on and near agricultural land outside of Buffalo, NY in the town of Perry. The project is titled the Dairy Hills Wind Farm Project. While the success of this particular project will be determined within the confines of New York state regulations, we can look at the steps HWE took in order to push for renewable energy to be placed on and near agricultural lands.

The land surrounding the proposed turbine development site is primarily used to grow crops like corn, hay, and alfalfa that are needed for dairy farming. HWE needs to take into account the physical impact that the turbines will have on the nearby farms. To provide minimal negative ramifications, HWE established a set of agricultural considerations that was to be included in the landowner contracts. HWE's model can be useful to developers designing contracts for Vermont dairy farmers. Some of the considerations include (EDP 2006):

- Locating all turbines and other structures along farm field edges
- Limiting road construction to 16 feet in width and following existing hedgerows and field edges to minimize loss of productive land
- Avoiding disturbance of surface drainage features or installing necessary structures to make sure roads do not interfere with drainage
- Considering how to clear vegetation before construction commences
- Replacing all removed topsoil
- Requiring the developer to bare all costs for excavation, clearing, construction, etc.
- Requiring the developer to be in charge of monitoring through specific tests to ensure the developer remains liable for their building practices

In addition to agricultural considerations, it is beneficial to look at the lease agreement template HWE used to see if a similar set-up could be used for developers participating in Vermont's program. For HWE, there are approximately 54 individuals that own the 96 land parcels that make up the project area. HWE has offered each of these individuals a standard form of agreement that provides compensation during the project's development, construction, and operation based on uniformly applied formulas. The payments are estimated to be between \$6,000 to \$12,000 per year (EDP 2006).

To gain public support for the project, HWE highlights how the development of the wind farm could potentially increase the income of struggling dairy farmers. They argue that the incremental income from land leases will diversify the revenue streams for participating farms, easing the burden of increasing agricultural production costs. A study conducted by the Land Policy Institute at Michigan State University concluded that as wind production increases,

lease payments would increase the overall vitality and income of farmers (Adelaja and Hailu 2008). To highlight the potential economic benefits for the local economy, HWE states in their proposal that the economic impact of the wind farm will be positive. The construction as well as the ongoing maintenance and operation will generate revenue for local contractors and create permanent jobs. Additionally, the revenue from lease payments can be spent locally, benefiting the local economy (EDP 2006).

On May 12th, 2010 the Town Board of Perry voted to enact a one-year moratorium on the project to allow time for the town to ammend the existing wind enery laws (Surtel 2010). Some residents from the town of Perry are opposed to the project's development, such as Rachel Barth, a Perry village resident that does not have land involved in the project. Her arguments provide useful insight for the Vermont legislature as they move ahead with H.518. Barth's arguments are listed below (Barth 2006):

1. "The Town's Comprehensive Plan, which is our constitution for permissible development, does not permit industrial applications like Dairy Hills in the township's agricultural zones. There has been no attempt to address this shortcoming by anyone. If Dairy Hills goes through, the Comprehensive Plan will be worthless."

TAKE AWAY MESSAGE:

- Solar development on dairy farms must be excluded from development laws. Permission to do so is already included in H.518.

2. "Locally, only a few will benefit to any significant degree in our community from this project. The turbine companies will reap huge profits, local land owners will get some lease income (perhaps a lot of it depending on how many turbines are on their land), the rights of neighbors who choose not to participate will be crushed, and the town will get some crumbs scattered on the floor by the turbine company. For 14 years I put business deals together, and this is one of the worst business deals I've ever seen."

TAKE AWAY MESSAGE:

- If H.518 is designed to aid dairy farmers, then the lease agreements need to ensure a proper income flow to the farmers so as to not hurt the dairy industry. The bill might consider employing a minimum lease payment agreement so developers cannot take unfair advantage of farmers.

3. "Our only remaining economic asset, the town's farmland, is in jeopardy of being lost to industrial applications like wind turbines. Many acres of cropland will be lost because of the Dairy Hills project, perhaps never to return to production. Is the short-term benefit really worth a potential loss of our only economic asset? I am not ready for that gamble."

TAKE AWAY MESSAGE:

- In Vermont, the dairy industry is already struggling, and H.518 has the potential to greatly boost a dairy farmer's income.
- However, if H.518 is not as successful as it intends to be, it can potentially further hurt an already struggling industry if lease payment contracts are not written with the protection of the dairy farmer in mind.

Synthesizing Concerns: Issues at Large

Economic and Political Issues

1. Attractive lease payment – Lease price needs to be competitive with the rent payment a farmer is receiving from a program. For instance, under the Conservation Reserve Program, a farmer receives \$200/acre/year. Although standard lease rates for land vary throughout Vermont, the highest rate is currently \$100/acre/year (Bob Parsons, Appendix C-3). According to Parsons, \$200/acre/year would be an attractive lease rate considering this current standard.
2. Salary share vs. lease payment – Farmers and developers voiced interest in differing payment agreements. Based on the following options for the farmer-developer relationship, the bill could be adjusted to make the contract more lucrative for the farmer:
 - Lease
 - Lease + adjustments based on revenue
 - Lease + percentage of revenue
3. Tax equity and loans – Developers seem to be excited about solar development on dairy farms, but in order to access the tax break developers must be Vermont-based. Since the tax burden has proven to be too heavy for many Vermont developers, they should be allowed to partner with venture capitalists. Additionally, tax break laws should allow for any developer to access the tax break.
4. Infrastructure costs – The cost of transmission lines, construction or access roads, or terrain excavation varies by location and will have differing financial effects on developers.
5. Costly permitting process – Due to the relative low land impact of solar development, the permitting process set up for other energy technologies should be expedited or even bypassed for solar technology development.
6. Property value – Lenders holding the mortgages of dairy farmers might be concerned that their collateral, such as buildings and land, could be negatively impacted by solar panels because of aesthetics, etc (Bob Parsons, Appendix C-3). How much control does the lender have over how the farmer uses the land and whether solar development can occur? Lenders are typically in favor of new sources of income, but that might come into conflict with the value of land (George Putnam, personal communication).
7. Conflict with existing programs – Not all farmers are going to be able to engage in the bill if they are afraid of getting kicked out of programs such as land trust agreements and conservation reserve programs. This might limit the number of dairy farms that could participate. Does this conflict with the state's goals for creating the bill?

Personal Issues

1. Being a farmer first – Farmers are in the business of dairy farming. While there is interest in energy development, farmers will likely only get involved if they benefit financially. The salary and/or lease share they receive must be more than what they are making off of that land as they are currently using it for farming purposes.

2. Aesthetics – This did not come up as a huge concern. Some farmers might prefer not to see the panels, but others were indifferent. The public will likely also have a split view. For instance, tourism might be negatively or positively affected. The state might find solar panels boost tourism and Vermont's reputation as a leader in renewable energy.

3. Inconvenience – Solar panels should be placed away from cropland so farmers can move tractors and other farm equipment around. Solar development might inconvenience farm duties otherwise. This could ultimately affect siting.

4. Developer responsibilities – Farmers are going to want a detailed outline from developers on what they will do to mitigate impact to their land. The New York Dairy Hills Wind Farm project developers created a very detailed plan for farmers. After an initial site analysis, developers will have better success in securing long-term contracts with farmers if they take their construction plans into careful consideration so as to not disrupt farm land and practices. Additionally, if the developer goes out of business (bankrupt) or decides to back out of the project, farmers will not want to be held financially responsible for restoring land to its original state.

Physical Issues

1. Prime agricultural soils – Not all farms in Vermont will benefit equally in the program since the law prohibits development on prime agricultural soils, which are found on some farms, but not all. This will affect participation in the program.

2. Three-phase lines – Solar panels need to be connected to the electrical grid via three-phase power lines. Currently, many dairy farms have access to one-phase power lines only. However, developers have said that with enough money any farm can be connected to the grid. This was expressed as a heavy concern among farmers, but was not a concern for developers.

3. Slope – After an initial site analysis, a developer will decide if solar development is feasible. Studies have shown that the ideal slope should not be greater than 15 degrees. This will also impact farm eligibility.

Case Study: Crawford Family Farm

In order to better understand how H.518 might operate on the ground, a case study was conducted in which a developer and farmer were brought together to discuss the hypothetical possibilities enabled by the bill. This conversation, held between Jim Crawford of Crawford Family Farm and Chad Farrell of Encore Redevelopment, grants a better understanding to the potential relationship between the farmer and developer (Appendix G).



Encore Redevelopment is a young firm based in Burlington and founded by Chad Farrell, P.E., in 2007. They offer expertise in working with environmentally challenged real estate. Recently they have become more engaged in looking at environmentally contaminated property, such as landfills and mining sites, for renewable energy generation purposes.

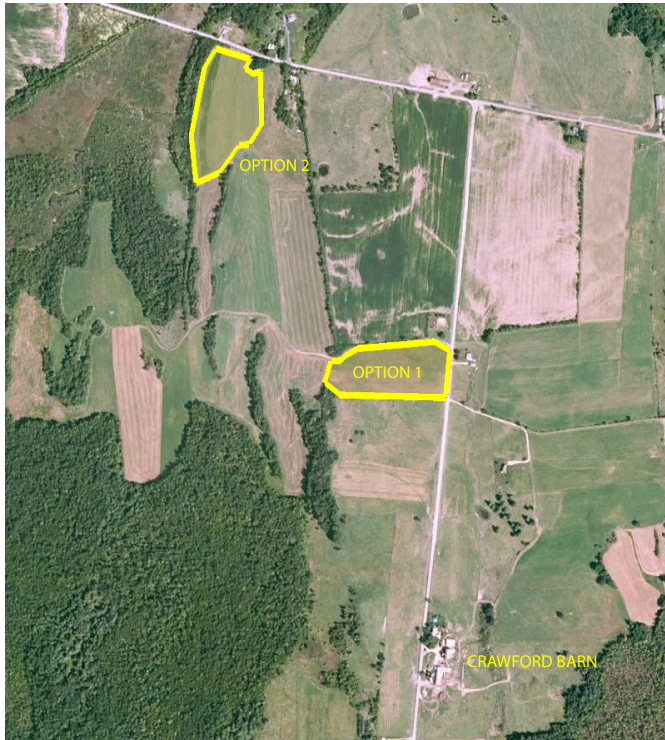


The Crawford Family Farm, based in Whiting, Vermont, was founded in 1950. More recently, the second generation of the family (three siblings: Jim, Cindy, and Sherry) have diversified the dairy farm to include cheese production. They have 60 milking cows and a total of 330 acres. Two dozen of these cows provide the milk for the cheese. Their farmstead cheese, named Vermont Ayr, has been gaining distribution across the United States.



One of the fields that Jim Crawford would consider for solar development.

Case Study Continued



Findings: Farmer

Jim has enough land to set aside 10 acres without creating a financial burden for his operation. Solar development would not only provide some extra income during a time of unstable milk prices, but would also benefit the marketing of his cheese production.

Jim identified two plots of land that he would consider for development. Both are easily accessible, run along three-phase powerlines, do not contain prime agricultural soils, and have good southern exposure. By leasing the land to Encore or any other developer seeking the standard offer under H.518, Jim would most likely gain 3-5% of the revenue from the array. With a 10 acre, 2.2MW array, this could translate to about \$2,000 per month, an additional income of \$24,000 per year.

Findings: Developer

For Chad, the solar installation must make a profit, both for the goals of his company, but also for other parties involved such as loan partners and tax-equity partners. Under the current Feed-in-Tariff program in Vermont, this has proven to be a difficult proposition for developers already pursuing projects. In January 2011, the 30% tax cut offered by the state will expire and be reduced to 7.2%. Without this incentive, the hurdles before a successful solar development become even larger. In addition, for some developers, the drop in standard offer for solar from \$0.30 to \$0.24 during the first review is even more foreboding for future incentives, especially in light of such high standard offers in other places such Ontario and Germany, which price solar at \$0.44 and \$0.76 respectively.

This case study demonstrated that H.518 provides great opportunity for passive economic support of the dairy industry. However, it also illustrates the necessity of a developer in this relationship and the importance of incentives in the creation of a renewable energy infrastructure.



Rendering of Jim Crawford's preferred location with an array.

Moving Forward:

Recommendations for H.518

1. Priorities of the Bill: Dairy Farmers or Solar First?

As we consider ways to improve the proposed bill, we must first ask, what are the bill's goals? We understand that the state Agriculture and Natural Resources committees wish to both incentivize and encourage the development of solar energy technology and financially stimulate the dairy industry. Solar is a renewable energy technology that is currently uneconomical without a subsidy program in place. The dairy industry is also suffering economically. Both solar and dairy could benefit from state support, but depending on the state's priorities, we have different recommendations for moving forward with the bill as it stands.

Priority: Dairy Farmers

Dairy farmers currently have no control over the price of milk, and have been losing money on the milk they produce for over a year now. As Claire Ayer of the Vermont Senate points out, the dairy issue is a national problem, and is a result of over-production of milk (Appendix C-4).

Recommendation: Focus more on the root of the problem—the supply management of milk.

The economics of leasing to developers might not make sense for dairy. Bob Parsons, a dairy economist at UVM, thinks that even an attractive lease rate from a solar developer for dairy farm land would not produce enough extra income to “save dairy” (Appendix C-3).

Recommendation: Within the bill, establish a minimum lease rate for dairy land above the current standard, or mandate both a lease and salary-share relationship between the farmer and developer. Another option would be to create a back-up fund that farmers are made aware of in the contract period so as to be protected if the project fails.

The suitability of solar development is highly site-dependent, and some dairy farms are much more suitable for the development of other renewable energy technologies. To optimize dairy farmer participation in the program, the bill will need to create opportunities for developing other energy technologies.

Recommendation: Open up the bill to all renewable energy projects.

Priority: Solar Development

Solar technology development requires financial incentives, not further restriction. Development on dairy farm land specifically may create more restrictions and limitations. It forces developers to choose from limited physical sites and perhaps pay a greater lease rate on land than they otherwise might. In conjunction with this, many non-dairy farmers and community leaders are concerned that dairy farmers are getting an unfair share of aid (Paul Stone, Appendix C-5; Bob Parsons, Appendix C-3).

Recommendation: To account for these concerns and make development of solar more feasible, the state could allow all types of farms to participate in the program.

2. Small Scale Projects: Supporting Solar and Dairy Farmers

Under the proposed bill, proposals for smaller solar projects, i.e. projects for fewer than 250 kW, would not be accepted. Projects under this size would be treated as net-metering projects. This is because the bill intends to incentivize the development of commercial-scale PV solar plants. For dairy farmers, this is limiting in a couple of ways. First, farmers would rather use abundant rooftop space than fertile cropland for solar development. However, covering rooftops with solar panels will likely not equal more than a 250 kW project. Second, developing on a larger scale will also create conflicts with the guidelines of other farmer programs. For example, involvement with the Vermont Land Trust prohibits a farmer from developing his or her land on a commercial scale. Fifty percent or more of electricity produced by any energy development project must be used on-site. Opening up the bill to smaller development projects would foster further participation in the bill by dairy farmers as well as open up more suitable sites for solar development on farms.

Recommendation: The bill could support small-scale projects under 250 kW.

3. Clarify Terms

The bill currently approves solar development projects that are sited on “dairy farm” land, where the operation of the dairy farm is done by a “farmer,” both defined under previous statutes (Appendix F). However it is unclear how participation in the bill would be affected by either the dairy farmer going out of business or a change in use or ownership of the land. If a host dairy farmer goes out of business, is the land still “dairy farm land?” Would the developer still receive the standard offer?

Recommendation: The bill should clearly state how long the land and the farmer technically need to fit their cited definitions of “dairy farm” and “farmer.”

4. Make Process Easier on the Developer

Developer participation could be hindered by the current frustrations with the permitting process and the challenge of teaming up with in-state venture capitalists as well as dairy farmers. There are several ways that the state could streamline developer participation.

Recommendations: First, establish a database with interested venture capitalists in Vermont, making a process that is usually time-consuming less so. Second, open up tax break laws to firms throughout New England. Third, set up a database of interested dairy farmers that developers can contact to facilitate connections between developers and farmers.

Recent Developments

Since the conclusion of our research, the state of Vermont has developed two bills that directly follow suit with our recommendations to streamline the solar development permitting process and expand the H.518 solar development subsidy to allow all renewable energy technologies to access the incentive.

Bill H.781 was passed in early May 2010. It specifically proposes to streamline the permitting process for renewable energy projects such as solar development. The bill directs the Public Service Board to streamline the Act 248 process for any renewable energy project with a capacity of 2.2 MW or less. The bill also consolidates environmental and municipal appeals to renewable energy projects and guarantees access to the solar energy investment tax break for all solar energy projects of 2.2 MW or less.

Bill H.518, the Dairy Farm—Solar Power Initiative, has since been amended to allow all renewable energy technologies access to the incentive. It is now called H.518, the Dairy Farm—Renewable Energy Initiative. The amended bill has the same stipulations as the original. One exception is that the standard offer for non-solar development projects is provided for a term of 10-20 years, where as solar developments are subsidized for up to 25 years.

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Appendices

Appendix A: Interview Transcripts and Summaries – VT Dairy Farmers

1. Interview with Ted Foster of Foster Brothers Farm, Inc. on 3/02/2010 Middlebury, Addison County, VT

Foster: Well, moving on to solar. Right out there on the barn. I can see some black material covering the roof/side of the barn, ridged. There used to be some black material covering that wall and roof, there. It got old and disintegrated this past year/recently. Back in 1978 I painted the cinder blocks black, then pleated on/tacked on some black “cowwall.” That produced a lot of heat. He also designed a solar thermal pool-heating system for the water in his swimming pool using black material/tarmac or something and a black hose running underneath. He got 120 degree water coming out of it.

Interviewer: What do you think about solar (to produce electricity, specifically PV technology...) in general?

Foster: I think we need to get it down in price so that it's cost effective. If we can do that, then it's a good thing. One of my big concerns is its effectiveness in shade. I have a feeling that it is probably less efficient in shade, but can it run at all? Vermont has a lot of shady days/cloudy days without sun. So that might be an issue. And it won't run at night, so solar is definitely not a base load technology. It won't be replacing VT Yankee or anything. Right now you pay a lot of money for solar, but then you can't use it all the time. If it can become inexpensive to do it, and we develop ways to make it less expensive and store the extra energy for use at night and the 3 days out of the week it's shady, then that's good...we're definitely headed that way, much more so than with wind. Wind is even less dependable in my mind. Why? I always drive by the college's windmill and so often it's not even spinning! So not enough wind is an issue. Also if there's too much wind you have to put the brakes on because it will overrun the windmill. You have to find spots where there is a steady supply that's not too strong—that kind of siting seems difficult in Vermont. The only other thing is aesthetics. A lot of people talk about the aesthetics, that they don't want to see the windmills out on the ridges of mountains. I personally love to watch the big windmills spinning. I was in Germany and saw the big wind farms there...it's so majestic. I think a windmill is a lot more attractive than a big cell tower or power line on a ridge.

You know we used to not use electric lines, but it's such a more efficient way to transport energy. The question is how are we going to get our electrical power.

Interviewer: What do you think about the state proposal?

Foster: I would not place solar arrays on dairy land. Maybe use wastelands or other lands (of course with these lands you have to consider the infrastructure needed to transport the

electricity from farther distances, but...). We need all our dairy land for crops. If I have good, productive land, I want to use it for crops to feed to my cows.

It would be a lot better to use the roofs of our buildings and barns. Maybe have solar roofing shingles. This makes a lot of sense to me. There are so many houses and buildings with asphalt-material shingles. Our barns all run east-west to capture wind for ventilation, so they have these large roof surfaces facing directly south. In the winter, the sun is almost always coming from the south. Of course you'd need to worry about snow buildup, and have a way to keep the snow load off the arrays.

Interviewer: Is multiple land use possible? Would you consider positioning arrays among pasture and crop land?

Foster: I would say no. When we harvest, we have to travel over every inch of our land. It's bad enough trying to work around a power line pole at the edge. With every extra turn, it makes our harvest more inefficient. You even waste harvest if the grain shooter misses the capture bin on a curve. Just like when you're mowing a lawn, any extra obstacle causes problems, and makes the job more inefficient. These poles also create shadows, which prevents photosynthesis of our crops and limits their productivity/growth. Trees and bushes on the edges of crop fields are also an issue.

Interviewer: Do you have extra land you're not using?

Foster: We have extra land around the farmstands, the barns and buildings here. Also on the ledges. But you have to consider getting to that land with access roads which would take up land. And you have to either have electrical line poles which will take up land or bury the lines deep enough so they won't be disturbed by our tilling. As for grazing land, if arrays were in the land while the cows were grazing, they'd bump into them. We'd need to put up a fence and section it off. But I'd worry about weeds growing up inside that fenced area. How do you maintain that? That takes energy too. I'd need to know I was making enough income from the solar panels to donate that land and set it aside for that, and not use it for my cows. I'd need to know I was making enough to not grow that feed or have that extra 5-50 cows. It's really a matter of economics.

Interviewer: What would you consider if you were trying to calculate what you'd need to earn off the solar development to make it worthwhile?

Foster: You'd need enough money to say it was worth not growing feed on that land to feed a certain number of animals. I don't know a figure off the top of my head. But we've calculated that it's about a \$100/acre profit that we make growing our own corn for feed versus buying that feed from another farmer, and about the same for hay. That's about all I could tell you. We need this profit on the land in order to justify/make up for the upfront costs of buying new land and/or the land taxes.

Interviewer: Can you think of any other issues with having solar development on your land?

Foster: I would worry about how the [sectioned-off] land would be maintained. I wouldn't want them using chemicals to keep the weeds down. How would they make sure it wasn't overgrown? I

guess the only other thing would be aesthetics. I would be fine with solar arrays on my land. Also I would worry about how [the developers] would access the land. I don't want a swell hole in the ground during mud season b/c they have to traipse back and forth to get to the land. I also don't want there to be blacktop below the arrays. That's preventing the uptake of CO₂, and doesn't make sense. They should put solar panels down on the asphalt if they're going to cover the land.

Interviewer: What about your digester? How is that electricity used?

Foster: We use the electricity for ourselves. Back in 1980 when we built the digester the contract was set up. It ended up not providing enough money if we sold to the grid. At first it was 10 cents a kW, then it dropped to 2.25 cents. That just wasn't enough. Now contracts are different—Monument Farms is going to set up one, and he's able to set up with a subsidy program paying 20 cents per kW. Our digester is too old to take advantage of these subsidy programs.

I wonder about energy technologies dependent on subsidies from the state. Are they really feasible if they require subsidies to be economically successful? But then again buying oil requires a ton of subsidies, so... I think in general fewer subsidies is better. [Letting the marketplace take care of it means that it will be sustainable.] If solar arrays or a digester are funded by subsidies in the beginning, that's fine, but then they should wane off. If there's a 20 year contract at 20 cents, that's not really sustainable. I mean, when you're paying 13 cents/kW for [un-subsidized] electricity, you're paying not just for the production, but for the generation, transport, etc. Monument Farms would get 20 cents/kW just for the production. Is that really sustainable?

Interviewer: What do you think other farmers would think about this proposal?

Foster: If a farmer has land that they're not using, [letting it be developed] for solar would be another income source for that farmer. Another con to consider... As long as you don't have visitors to the solar arrays traipsing over your land and causing damage. And the infrastructure doesn't interfere—like large roads to the solar land or infrastructure creating obstacles in/around fields.

The solar arrays might also become other [practice] targets for hunters. I mean they've done it before—they've shot the insulators for power lines. [A solar array] is just one more thing that could get hit by a stray shot.

I wouldn't want trespassers on my land causing trouble. We let people use our land for hunting purposes, but only with permission, so if something happens, we know who to go after. [The solar arrays might attract people that might trespass on my land.]

The budget is tight in the state. There are a lot of people that are moving back after retiring to Vermont to gain the benefits from the state as seniors. All that money going to take care of aging people is straining the budget. He's concerned about the feasibility of subsidies for solar projects right now...

A lot of people talk about how large farms are [squeezing out] the smaller farms, and pushing them out of business. But it's really not true. There just aren't people to take over the farms run by aging people. There isn't the manpower in the upcoming generation. We get people coming here asking if we'll buy their land because they can't farm it anymore and have to get rid of it—there isn't anyone to take over the farm. But having solar arrays on the land might help people hold on to their land longer. A lot of people that are in the next generation of farmers—that aren't taking over farms but moving away instead—might come back here

after retiring [if the land can be held onto/if the land keeps making a profit].

He also talked a lot about subsidy programs in general, and health care reform. He's concerned how people might take advantage of a public option just like they take advantage of full coverage...people take what they can get and try for more. He has concern about how subsidy programs can be abused.

2. Interview with Marie Audet of Blue Spruce Farm, Inc. on 3/05/2010 Bridport, Addison County, VT

Interviewer: What happened with your digester? Why did it turn unprofitable? What were the issues?

Audet: The contract with CVPS was set up to sell electricity wholesale. We set up the contract 5 years ago, and we were the first ones. We were doing the best we could with the information we had available, and setting up a proper contract. No one—no one—even thought about or considered the fact that wholesale electricity prices could hit the low they did this past year. The price got so low and stayed low for so long this past year that it made it unprofitable for us, too. It was just an unexpected crash. Some economists say that it was due to the recession, and people were using less power, etc. I guess it's all connected, it's all those patterns as always. What's kind of ironic is that the legislature has set up this new FIT program for renewable electricity production. It provides sustainable revenue for the electricity produced by renewable technologies. When they were calculating the FIT they wanted to use, those numbers came up off the digesters; they came off of people like us. They came here and talked to us, and were able to make this new law based on our data. But then when they finally released the bill, we weren't included.

Interviewer: Why?

Audet: Well the VT legislature is into encouraging renewable energy in VT, and encouraging new projects. Because we're already here, we don't count. They don't care about us. My neighbor could put up a digester right next to me and get the funding, but we don't get anything. [We're sitting here struggling, and we don't get anything.] We're working to fix that, to get the legislature to include us. You know there are only about 6 of us [with digesters] that aren't included, and 3 of us have that terrible contract with CVPS.

Interviewer: It seems that who is included is going to be a problem for programs like these.

Audet: Yeah, you know the FIT bill also has a cap. They have a goal for how many MW will be supported. The people that are considering developing renewable energy now probably won't be included. But you never know. If this keeps developing and is successful, VT may be able to extend certain programs, and being included may become the norm.

We need to try to reduce our use [and dependence] on coal, oil, and everything else as much as possible.

Interviewer: What is your opinion about solar in general?

Audet: Well you know I'm for any renewable energy that's feasible. It just needs to make business sense. You have to be careful about this.

We have considered solar before, you know. We have a lot of south-facing walls on our barns, south-facing rooms, and roofs of barns. We'd love to have solar panels on these walls and roofs to provide electricity to power the fans in the barn for cooling. But every time we research it, it's so outrageously expensive. We just can't afford it when we're hanging on a shoestring. And the technology would be outdated way before it paid itself off.

Interviewer: The Agriculture and Natural Resources House Committees are discussing a program that would allow solar developers to receive subsidies if they can develop on land owned by dairy farmers. The dairy farmer could invest in developing the solar, or a separate investor could lease land from the dairy farmer. What might be the pros and cons of this type of program? Why?

Audet: You have to understand why dairy farmers have their land. We're a business, and we have land to support our cows, and grow feed for our cows.

You know when I talked to the solar [people], they said you need open land that's facing a certain way and sloped the right amount in the right direction. That land is all good cropland. We acquire land so that we can feed our cows. We just recently purchased new land and that land was \$2000/acre. We're a business, we don't just acquire land so that it's open for the tourists—even though there are some that would like to believe that. There are land costs.

If there's any way to make more electricity, that's great. But we always have to balance that with making more milk. It must be economically feasible to give up that cropland.

Interviewer: What would you consider if you were trying to calculate what you'd need to earn off the solar development to make it worthwhile?

Audet: I think that's what I was trying to explain. I'd have to think about reducing cow numbers and not feeding as many cows. The revenue would have to cover the revenue from the cows that are supported by that land, the milk they produce, etc.

Another way you could think about this I guess would be what it would cost to buy the feed off another farm. But that doesn't make environmental sense. We're trying to reduce the inputs on our farm. We don't want to put more trucks on the road. That would be a step backwards.

But yeah this is a business. You can't just do something because it sounds nice. It must be sustainable.

You'd really have to consider what you'd lose with the land and reducing cow numbers. There's the land costs, and we have a mortgage on our land. We have regulations for keeping our land fertile and open, and there are taxes on the land. Your revenue from solar would have to cover all of this. I'm not going to calculate this. I'm not going to make these calculations. That's more a job for an economist, to come here and consult. I could maybe point you toward an economist for those kinds of numbers. Do you know Bob Parsons, UVM? He's a dairy economist, and could maybe help you with those numbers.

Interviewer: If you were to participate in this program, how would you be most likely to participate, as a leaser or as the developer of solar?

Audet: We generally prefer to run things ourselves. In our experience, we are more efficient at it, we're always there, and we're more vested, you know. But it's a brand new technology, and we may have to have help. We might not have the necessary knowledge or skills for it. But I can't imagine there's that many skills, probably just maintenance and such. It can't be any more complicated than anything else you do.

...That's one reason I'm really proud of/happy with our digester. And I'm always happy to show it to people. All it does is take something that would sit there anyway and let it sit a little longer and use the energy. It just diverts a waste stream, using the energy in the process. There are no additional inputs. The cows just poop, and then it sits there and it's used for electricity.

Interviewer: How much land would you be able to offer up to solar if you could make up the revenue of the cows and pay for the land taxes, etc.?

Audet: If we could replace the money we make off the land now, and diversify the land and our operation, and produce more electricity to help on our farm, such as with the cooling of our barns, it's a no brainer [to develop solar]. But we want to make milk, we're tied to that. Also we have an operating permit as a large-size farm. You have to have a certain number of acres corresponding to a certain number of cows. That allows us to use our manure for fertilizer. It's not a problem if we reduce the number of cows with the number of acres, but that's something to consider if we want to keep our operating permit as a large operation farm.

Interviewer: If you were to participate in such a government program, what are other (existing) government programs that you might worry about being kicked out of? Other programs you might be exempt from?

Audet: No there aren't any programs that I can think of. It's all about paying the taxes on your land, really....

Interviewer: If you could develop any other energy technologies on your farm, without worrying about economic cost, what would they be? Why?

Audet: Yeah that's a great question. You know we'd love to replace our roofs with solar panels to produce electricity that can be used in our dairy barns, such as to run the fans for cooling. We'd be open to a windmill to do the same job, if that was doable. We'd could continue to work on our digester, too. We could do a better job with the digester. There are more efficient generators available, and new technologies we could utilize. But we have to balance the cost of all of that with what you get out of it. You met us a little out here. You know we're forward thinking and are open to all of that...

Interviewer: What do you think other farmers would think about this program?

Audet: You know if it would make them money...Farmers are at a point where they don't know what to do with their farms and animals; after a year of [bad milk prices] and losing money, they're trying to figure out what they're going to do; [they're lost]. This might be an opportunity for them to do something else with their land. But the costs and everything would have

to be examined. Of course that's a consideration for people that would not have a dairy farm anymore. For us here, [developing solar] would be about diversifying our farm.

3. Interview with Jim Crawford of Crawford Family Farm on 3/10/2010 Whiting, Addison County, VT

Crawford: I heard about the bill, and what I really like about it is the chance to diversify and market the farm based on using alternative energy sources. We could advertise that we make a difference on our carbon footprint, and use [environmentally friendly] technology. It would also give us the chance to make more revenue off the farm, and have a smaller electricity bill. I heard that the rate they were planning for the solar electricity was 30 cents/kW. That seems really high to me. It seems really generous of the state that they would back that price; that's a lot for the electrical companies to pay.

Even if the state can't do it, and doesn't come forward with a [subsidy] option, I would like to [develop solar]—you know, just go for it myself. I don't know if there's a market for me to do it myself, and just have people pay that extra to me.

Interviewer: What are other pros and cons of the current proposal?

Crawford: Well, the pros are: you get a long-term contract, there are minimal inputs, and you get a revenue stream off a set number of acres. There's minimal maintenance, so I've heard—maybe mowing to keep the land maintained, but not much maintenance.

But cons –you'd be giving up land. It's hard to know what land the developer might need to gain access to the solar development; that requires land too. There might be other cons... You'd need to know what's required of the farmer...[in terms of relationship to the developer].

Interviewer: You'd prefer to lease your land vs. developing yourself?

Crawford: If you're setting up for 1-2 MW, that requires 10 acres of land. You need 5 or 6 million dollars at the starting point. You know, that's... [not feasible for us]. I think you have to figure it will cost you one dollar per Watt? You know a developer might be able to make that investment, and do it at a lower cost. The ideal is to lease the land, you get a particular amount of money each year. But the life period of solar technology is about 20-30 years so they say. Payback for the initial investment will last 12, maybe 15 years if you're stretching it. That means you're getting a lot of reward in the long-term, and there's more in it.

Interviewer: What would you consider when deciding if you could give up your land?

Crawford: For developers, there are requirements for the layout of the land. I wouldn't be able to choose what land; I'd have to see what was feasible for the developer, if it has to be close to certain lines etc. I would have to know I'm giving up land that I'm currently using for agricultural projects. I'd need to know that I could give that up and still make everything work—ask whether I can make my operations work around that..

Interviewer: Are there programs you'd be concerned about missing out on?

Crawford: We're not part of the land trust or anything like that. We're in Current Land Use, which basically means that the state helps pay a portion of our land taxes. Will Stevens said they were going to try to take care of that.

Interviewer: How much land do you have, and how are you using it?

Crawford: We have 330 acres. About 200 are tillable acres, pastures. Mostly hay for feed, and grazing acres. We need all of that. Unless we could get a descent land rate [like through a lease] to give it up, in which case we could feasibly buy that feed and hay [(that we would otherwise be producing)] off of someone else. The rest of the acres are mostly swamp, some woods and ridges, and we have about 10 acres of buildings around here.

Interviewer: Would you have any other concerns about developing solar here?

Crawford: The appearance could be something. I mean it would be big. We're talking 10 acres full of reflective glass—that would be big. Developers say they'd need to put a fence around it—a fence that's 8 feet high, chain-link. You know I don't necessarily want that... I'd wonder with the transformers and such, if there was anything else [contributing to appearance]...I don't know. I'd just need to evaluate what the value of the land is, and what I currently get off of it, to consider different scenarios.

Interviewer: What if you could choose any renewable technology to develop here?

Crawford: Wind is not really an option here. We don't have the capacity for it (not enough wind, etc). We already burn a lot of wood here; we use wood for heating all the houses. We're not a big enough operation for a methane digester. It just doesn't make sense for us here, it's too expensive. I really like solar—it's maintenance free. You know it'd be nice if I could use the land in another way, like if I could put raspberry bushes in between them, on the land. I don't know if a developer would be ok with that or not?

Interviewer: You might be able to put in panels with a 10 foot clearance. How would you be able to use the land in that case?

Crawford: You'd have to be careful about the equipment you use. You wouldn't be able to harvest grass. You couldn't graze cows, they're too big. Sheep might be the only animal that would work. Goats are small but they like to jump...

Interviewer: What kind of developer would you like to develop on your land?

Crawford: I would want someone who was experienced [with this scale of development]. I don't want just some residential developer to come in and attempt it at this scale. I'd also like it if it could be built using local labor, instead of labor from out-of-state.

I'd want to make sure that everyone is protected [financially, in contract]—them and us. You know you set up these contracts for many years, but you never know what will happen long-term. Mentions the rise/fall of prices...

Interviewer: What do you think other dairy farmers would think about this program?

Crawford: Some might like it, others might not. I'm not really sure. I haven't had any conversations with them about it. Farmers tend to march to their own drum. I bet the responses would be across the board. Of course it depends on how each farmer is using their land.

Farmers here tend to have their own ways of doing things, irrespective of the next man down the road. They also like their openness [of the land]. When you get a big project in there, it could make a difference. Some will really like it, and others think it's foolish. When I think about placement on my land, I wouldn't necessarily want it right out there by the road. I'd rather have it back away, hidden. Though I don't know where it needs to be placed.

Interviewer: Could there be positives to having it right by the road?

Crawford: Well yeah it could be a good thing—for marketing and such. People could drive by or visit, and they see it when they come. It might also get people to talk about it, or other farmers to see that it works, and is working well.

Interviewer: Any other thoughts...?

Crawford: It really comes down to the economics of it. Like how much electricity are you really going to generate from your solar panels? They say there are 4 sun hours/day in Vermont. What does it mean to have a 1MW system; how much are you actually going to produce in a day? How much are you really producing?

A lease rate of \$18,000/20,000 a year for 10 acres. That's an attractive rate. But what does that contract really entail? What revenue is it generating, and is there a way to get more [money]? You know there are a lot of [developers/people] applying for these kinds of projects. That tells me there's money to be made in this business. It wouldn't be that way otherwise.

Other things that you guys might consider is narrowing down the farmers that are actually viable for this kind of development: the developers need certain kinds of land. They want land that's flat and has good soil. They don't want to develop on ridges or weird slopes. All of that makes it more expensive and more difficult. They want good soil, too—the solar pylons go maybe 6,7 feet in the ground, so... They also want 3-Phase. So you might want to find where those 3 phase lines are. This will all limit which farms are viable. Also we are really close to a [distribution center]. Our power is really reliable, and doesn't go out very often because we're closer.

If I were developing on my own, I'd want to know if I could maybe go in phases? Like establish 3kW every 3 years until I reach 2 or 3 MW? I could grow over time to take advantage of that improved technology over the years.

Interviewer: Maybe leasers could do that as well, starting with smaller projects to experiment, and then expand...It might be good to add that kind of flexibility into the bill.

4. Interview with Peter James of Monument Farms Dairy on 4/26/2010
Weybridge, Addison County, VT

Interviewer: My first question is what would be the pros/cons of the proposal?

James: The looks. Making sure that all the neighbors were fine with it. What could happen if there was an electrical storm or something shorted out. I don't know much about them. Another guy who works for the college, Dean Oullette - Solar Wind Solutions. I was actually going to call you and tell you that. He lives over here on Snake Mountain and runs one of the electrical shops at the college, and he's into that. He has a panel up over there and angles it to the sun, or maybe it's automatic now.

The things that would concern me are safety issues, aesthetics, feasibility...making it feasible that you could afford it. The last thing you want to see farmers, much in our case here, put a lot of effort and time and money into something, have it not work and drag them down more than most farmers are now.

Interviewer: I think giving the option of either leasing or developing could potentially help with that but I don't know exactly to what extent it could help.

James: When you say leasing...?

Interviewer: So you would lease you land to a solar developer, someone else to come in. They would have to pay you for the use of your land and you could also...

James: Get a percentage.

Interviewer: Right. Get a percentage of the income.

James: So, let me ask you...who would have control?

Interviewer: Who would have control of which?

James: Would the farmer turn over the control of his land to the leaser?

Interviewer: Right. Well that's a major question. How do you mandate?

James: Yeah. I would want to do that. There would have to be... I guess it would be like the guy who has beehives and wants to put them on your land so you give him a piece of you land, but it's still your land. Anytime if something's wrong, if bees are chasing people up and down the road, you can say "geez, I need those removed." I would think that would be the case with something like that if they're big and stick up in the landscape. But I'm all for trying things like this and that's why we're doing the methane. We had a raw product that had a value and we decided to stick our neck out and... part of it was that we needed a bedding source and we're going to take the solids, dry them, squeeze them, and use them as bedding. And that will be quite a savings because we pay \$2200 for a tractor full of sawdust every two weeks. That's just the milking cows, not all the other ones. So there's a big savings.

To do these, I'm going to refer to them as "green projects" with all the carbon credit that you can sell and make money on those; it's not about making money. It's about doing something that in

this case you can be green, you can feel that you're doing your part in the environment. You can feel that you're taking something raw, whether it's the sun, wind, or gas out of manure, and do something that can generate a payback. That can at least pay back your investment. Farmers can't look at it as my new venture, a money making thing, because it's not. It's just something that we have in our possession that we can capitalize on a bit. And solar, you're not going to get a bedding source out of solar.

If you have an area where you can put these panels up and you know, it's not going to look bad to the public or at least your neighbors then I'm all for it. It's the same with these wind turbines. Yesterday in the paper, there was a picture up on Lowell Mountain or something. Here's this beautiful mountain with the sky behind it and you picture all of these things stuck up there and I've looked at that mountain all my life I probably wouldn't like it. But you have to weigh out what it can do and how bad it would look.

(He asks me about my home town and wind turbines)

James: Have you guys gone and visited up in Hinesburg?

Interviewer: To see the solar arrays? We went to the CVPS display and the AllSun Tracker, All-Earth Renewables. They have a small one up there, so we haven't seen a huge one.

James: Is that what you think you would see if farmers were to do something?

Interviewer: Well they're proposing larger scale solar arrays, so I think it would have to be either fixed or tracking rather than rooftop, unless you had tons of rooftop because they have a lower capacity.

(More talk about how many panels would have to go up)

Interviewer: We're not talking about something that will take up huge expanses of farm land, and it's incredibly variable depending on what the farmers and developers want to do.

(He asks questions about physical constraints of site - shading, etc.)

James: In the Burlington Free Press, there was an article...of NRG up in Hinesburg....they've gone in a wooded area that's mowed and it's about 3-4 acres with a bunch of those things. To me that was smart because it was you know the mowed area was like this and they had oh, 4 or 5 in a row going across. There might have been twenty or something. And to me if you find a place to put it and fit it in.....I don't think there were any houses that could see it because...there were trees. And that's why I asked if there could be trees from you say here to that road (points across the street).

To answer your question.....It's not a natural thing. They're big shiny things, but if it could be done tastefully and put in with low impact to the environment - it doesn't effect wetlands or anything like that - and it doesn't affect the community, I think farmers would look at it. I would look at it. Sometimes I wish we had looked at solar. Dean came to me after he heard that we were doing the methane digester and he said "why didn't you look at solar!" You know at the point that we first started it hadn't gone through legislation. But there's certainly a lower initial cost and higher payback with a lesser kWh output. Although, what you were just saying, a 10 acre field of solar can put exactly

what our digester's going to put out...Wow.

Interviewer: Do you think that multiple use would be possible? Could you put it on cropland and still use the cropland or would that get in the way too much?

James: That would get in the way. I don't know what's involved with the interconnection for each one of...I would say, yes, if you're desperate. But, with the equipment that we have now, big wide equipment, it would be tough. I could see if you have a ten acre field and you have a row of them here and one here (very far apart) and there was a couple hundred yards in between you could do it. It wouldn't be optimum. Farmers are desperate for good quality land for crops and to till that land with these things in the way....If it was hay you could do it. To grow corn, it would be a real challenge. It wouldn't be something you would want to do. Unless you were just really foolish. (laughter)

Interviewer: Do you have any extra land that you could see putting the panels on?

James: You know a lot of times I look at our business and we start out near Middlebury and go all the way out to Snake Mountain. So we have up here on the ledge - this is all ledge and rock and stuff - and then it drops down in the valley and is clay and the river and down on the bottom and up to Snake Mountain. Yes we have areas. If this was something we wanted to do, we would have areas that would be ideal that would be out of sight. I'm thinking of a place right now. After I saw that picture in the paper and after one of your phone messages telling me what you were doing, I was thinking about it and we have a field that would be ideal for it because its all closed by woods. Yet, it's this nice little field that no one knows is there. It would be ideal for something like that.

(Slight pause and laughter as Peter looks out the window)

I tell you sometimes I wish we never took on this methane digester. See all of these papers over here that's just the timeline and it changes daily.

Interviewer: Well, from talking to solar developers it sounds like the permitting process for solar is pretty intense as well.

James: We are waiting for our certificate of public good right now. It was supposed to have been here at the end of March, and it was supposed to have been here by the 10th of April. This other farm that I was telling you about, they milk about a thousand cows (we milk about 500), and they're putting in all they're young stock manure into the digester.....Our max capacity is 125 kW. Theirs is 430. That's a lot of power. Whether they will do it or not. I don't even know if we can do 125 and off-set our electrical bill. We have a \$80,000 electrical bill a year for all of the houses and farms. If we can offset that as well as save on bedding we're looking at a 5 year payback. That's pretty good, but now you know, thinking about what you're talking about. The maintenance...I wouldn't think that the maintenance would be anywhere near what we've got. We've got running equipment going 24 hours a day.

Interviewer: Yeah, maintenance is really low for solar. It's basically non-existent.

James: What kind of reactions have you gotten from other farmers?

Interviewer: We've gotten a lot of general interest, saying they would think about partici-

pating. Whether or not it's actually feasible would be up to them and the developers, or just them if they're doing it themselves.

James: You know what's going to scare a lot of farmers who are generally pretty cautious? The word "developer." They lose interest... it would be like you having 30 acres in VT or WV and a developer coming up to you and saying "hey I'd like to buy your land, or co-own it with you, and maybe we can put a picnic table up on that hill"...Yeah right. All of a sudden it's a lot more than you want. So, there would have to be some really good guidelines.

(Interviewer talking about recommendations for developer and farmer relationship)

Are you guys looking at farmers in this particular case because farmers have land?

Interviewer: I think that the state has gone for dairy farmers to help the dairy farm industry.

James: That was my next question. Is it because dairy farmers are struggling?

(More talk of the bill's purpose and James's mild regret about not looking into solar prior to starting the digester project)

Interviewer: Do you know how much money you would have to make from it in order for it to be worthwhile? So thinking about land value? How much you would have to be compensated for the land value?

James: Depending on where you put it. Good corn land runs for \$50/acre with no crop. So I would say...if it had the same possibilities that say this one acre of corn ground and that corn ground may produce 20 ton of corn at \$30/ton that would be \$600. You would have \$600 worth of crop with the \$50...well actually it's about \$350 if you have to rent the land and then you throw in all of your costs seed, fertilizer, labor, tractor time. You would have \$300/acre. There's \$300 dollars profit if you sold that crop. So I guess you would get, if you were going to keep it inline with what a farmer could do if he had extra land and was going to sell it maybe \$200 profit. I would say that to step out and rent land to a developer, the farmer would need to get...I would think \$400/acre because he is not going to have it. And you asked if you could crop around it - I don't think that would be very feasible. It all depends. Any picture that I've seen they're not that far apart. And I'm thinking about the one down in Rutland, CV's, you wouldn't even want to mow around that I don't think. So, yeah, you'd be giving up that acreage.

Interviewer: I have a few specific questions about your land and cows just to place you with all of the other farms we've talked to. How many acres do you have total and how much of it is crop?

James: What we own and rent? We own 2200 acres and of that 2200 acres there's probably 1350 is tillable. We rent another 400 acres. We're tilling about 1700 acres.

Interviewer: Cows?

James: A little over 500 cows milking. We have about 1,070 head total.

Interviewer: Do you have VT Land Trust land?

James: We do have some. One of our farms that we purchased in 2000-2001, the development rights were sold in transition between the previous owner and us. Then we bought out a little farm over here. The guy worked for us for about 15 years. Then we bought his land 2 years ago now and he had sold his rights. So, we have that conserved land. Last year we bought some other land that the development rights had been sold. (General talk about Vermont Land Trust) More than 3/4 of our land is not under the land trust. 300 acres in the Jane Groff Farm is conserved. 90 acres right behind us here and probably another 45. So it's not very much. (General talk about changes to current use that have take place)

5. Interview with Greg Bernhardt and Hannah Sessions of Blue Ledge Farm on 3/08/2010 Salisbury, Addison County, VT (Summary)

They are very interested in new energy technologies.

Bernhardt: The incentive would have to be remarkable, we have already had a solar developer look at our energy portfolio. It would cost us \$180,000 to invest in enough solar panels to cover the cost of our own electricity consumption. It would have to be majorly subsidized. Neighbors that have invested in solar energy have said that it was a waste of money. Looked into windmills, but the land isn't appropriate to make windmills a viable option

Sessions: If somebody approached me to lease land, right now I would say no because we're small enough to see all of our land. I don't know about bigger farms with a thousand acres. The Vermont Land Trust would have to say yes. We sold the agricultural rights to wetlands on the property. They don't know if the development would cause them to lose primary agriculture status to some of their land.

Bernhardt: It is mind boggling how much solar panels would take to offset their energy use. If it would pay off in a year or two or three, maybe.

One developer was going to put in a \$100,000 solar project. Considering that Blue Ledge's electricity consumption would take \$180,000 in solar investment to their relatively small electricity consumption, it seems silly for the state to invest subsidies in such small projects (he feels that small scale solar projects are maybe not going to make a difference) How much is this really doing? How is this realistic? It seems like there is quite a bit of wind, but we're not in the right place for it.

It's the cost concern. We do have a wood burning stove, it's not the same pollution as coal, but it does emit particulate pollution. We looked into alternatives like gasification and wood chips but, they're too expensive.

Don't think the dairy farms would produce more electricity than is used on the farm. We have a \$500 electricity bill. It would take \$180,000 in solar investments to offset our electricity consumption. If this was to be implemented across the state it would require millions of dollars in subsidies.

The government would need to completely subsidize the projects. I just don't believe that its going to be small corporations. We need economies of scale. Running a small business is one of the most authentic true capitalist pursuits. Usually if you meet someone as liberal as us, (who owns a small business) they are going to be fiscally conservative. If I had \$180,000 I would invest in the stock market and be a millionaire.

I wouldn't want the solar panels on my property, but I wouldn't mind seeing them on my neighbors farm. Farmers want to be farmers. They would rather grow a crop on their land than build something else. There are other things that the government could do to help out farmers. The character and root of farmers is the desire to farm.

Interviewer: Would multiple land use be a possibility?

Bernhardt: Goats would try to jump on the panels. I would be okay with that maybe, as long as I wasn't responsible for fixing the panels. Sheep are probably the only animal that could graze with solar panels.

Interviewer: Would changes in taxes and tax brackets be problematic?

Bernhardt: Taxes could become an issue. My initial feeling is that the government should be doing things to help farms continue. The state of Vermont voted to allow wind developers access to Ira, VT. The town of Ira is situated to benefit dramatically from windmills. But, the town voted not to support the wind development. Uncertain whether the initiative is designed to benefit dairy farmers or to support the developers.

A solar developer in Rutland was dishonest with the local residents and the landowners. It might culminate in a legal dispute. (There is a notion of distrust among some farmers towards energy developers). Can't imagine that dairy farmers would be interested in leasing land to developers. Vermont farmers don't want to create a cooperative with other farmers; they would certainly be hesitant to go into a deal with people in another industry.

Interviewer: What would be the best case scenario for Blue Ledge to support the Dairy Farm – Solar Power Initiative?

Bernhardt: I would be interested in maybe putting solar panels possibly on the roof. As long as it was so subsidized that it was a minimal cost to me, as long as it would pay off in one, or two, or three years. But I doubt that it would compensate for more than 1/3 of the energy used by the farm. I don't think that the Vermont Land Trust would allow it. I signed a contract that said I can extract no natural resources, maybe harvesting solar power is different.

6. Interview with Clement Gervais of Gervais Family Farm on 3/10/2010
Enosburg Falls, Franklin County, VT (Summary)

Interviewer: When and why did you get your digester? What has worked well?

They have a total of 950 cows. They installed the digester 1 year ago for the purpose of creating their own bedding for the cows. They would produce methane from the process anyway so they use it for electricity. Their digester has a 200 kW capacity and the farm uses about 60 to 100 kWh at any given time. He said the generator is always operating at 200 kWh so their exporting half of that into the grid. The downside is that the value of their exported electricity plummeted recently (similar situation to Blue Spruce). Fortunately, they're off-setting all of their electricity use so their not losing money, they're just not making as much as they could otherwise.

Interviewer: What do you think about the use of PV solar technology to produce electricity in general? Is it a good idea or even feasible?

Clement said he doesn't know much about solar. It sounds like a good idea but the biggest hurdles will be public acceptance and the economics of it. He said the methane was expensive and the only way it was worth it was because its positive economic effect is sustainable for them. Solar would have to be the same way. It has to make economic sense. There's money available for these projects but ultimately it needs to be sustainable.

Interviewer: What do you think about the state proposal? Is there a place for PV on dairy farms?

It would be good for farms if they have excess land – land that's not prime ag or woodland – land that doesn't have good use. He wouldn't want to put it on his limited cropland. They do have extra land on the Gervais farm; only about 60-80% of their land can even be used for crops, so the rest that's just sitting there would be great for solar production. In terms of energy production and investment, Clement said he would probably lease the land and let someone else take the risk at least until he sees the economic potential and understands the technology better – then he would think about investing on his own.

Interviewer: Would you consider multiple use? Could you position arrays among pasture or cropland?

He said he would put it in pasture, shrub land, basically any sort of fringe land that has no value at this point.

Interviewer: Would you be more interested in standing solar array or rooftop?

He said he doesn't really know, but would be open to either.

Interviewer: What would you consider if you were trying to calculate what you would need to earn off the solar development in order to make it worthwhile?

He said he would first have to consider the value of his land. If he could increase the value of

land that would otherwise be low, that would be a great investment. He would also have to consider the risk involved (which would probably lead to him leasing land), investment and payback period as well as the life span of the technology and the maintenance and other future costs. He was very impressed by the long life span of solar and that you don't necessarily have to upgrade. He was also impressed by the low maintenance needs.

Interviewer: Are there any programs that this program might conflict with?

Development rights. A lot of farms in his county have sold their development rights to either private or state programs which keep those farms from ever being developed. He thinks that could definitely be a major problem and the farmers would have to apply for special permits. The rules for these programs are very strict. He purchased part of an adjacent farm in the past and had to get it divided because of the development rights. "I can't tell you how many meetings I went to for that." He thinks that could be a huge hurdle for a lot of farms.

Interviewer: Are there any other issues with having solar development on your land?

Farms would need to be in a good location with access to the grid. He had to install some new infrastructure for his farm. He is 4 to 5 miles from 3 phase but manage to get through with one phase, so cost of infrastructure was not as much as having to upgrade to 3 phase, but was still comparable. Emphasized that a lot of farms are not near utility connection and that could be a major problem for the solar initiative.

He then brought up FITs. He said it's a great idea for the people who are generating the energy and unfortunately he, as well as some other farms, installed their digesters before the FIT was passed. He wishes he was a part of it in order to maximize his income, but he is also concerned with the fact that it is asking everyone to pay. All dairy farms would have to pay for some farms to make more money. Dairy farmers don't really have the financial flexibility to do this at this point.

Interviewer: What do you think other farmers would think about this proposal?

Renewable energy is attractive and a good idea, but ultimately "dairy is hurting" right now. With the milk crisis, dairy farmers lost a lot of money and there is no recouping that loss right now. It will be 3 years until they can get back even to what they were making at the beginning of 2009. There is money to be gained from renewable energy but it won't come from farmers. Not right now. Dairy farmers would opt to lease their land if it makes sense for a particular farm. "Farmers want to get as much as they can out of something – that's their nature." But, there are limitations. He said major funding would need to be involved but he still thinks that most dairy farmers would be looking at leasing. Farmers won't be looking at the fact of promoting solar. At this point "they will be looking at the check they're going to get."

Appendix B: Interview Transcripts and Summaries – Solar Developers

1. Interview with John Guerin of EOS Ventures on 3/18/2010 (Summary)

Interviewer: How do you feel about the SPEED program?

Guerin: In all of the projects we have ever done we have never had to go in front of a board or do environmental impacts and things of that nature, but of course all the other projects are home sites and not 3rd party utilities.

Definitely a lot of costs we have not seen before

Because it goes to utility it receives personal property tax

Haven't seen this in other states

Rent is something we haven't dealt with before, but that's nature of the feed in tariff. The feed in tariff is great if you can take advantage of the taxes in Vermont.

Interviewer: You develop throughout New England and I'm sure you've encountered many different government programs...Are there any that you feel work well for developers? Do any stick out as problematic?

Guerin: We are having a difficult time finding adequate tax partners (they don't have the tax appetite, they don't want to go in on a project as a tax equity partner with something they don't fully understand). The bill is making the margins much slimmer than previously thought.

Vermont is the only state they have seen that has an in state ITC. Others have rebate program or a ____ (rate?) program.

Berkshire bank has been their partner in CT and MA projects. Bank wasn't able to help them in Vermont because they pay a banking fee rather than a corporate income tax. The number of organizations that have that tax appetite (millions) is really not that many.

Interviewer: What are your concerns about the Dairy Farm – Solar Power Initiative?

Guerin: Renting vs shared income? There are many ways to finance these deals and flexibility is needed for success.

Diminishing returns: Industry says panels will reduce 0.5% a year as well maintenance and operation costs increase over time, so as time goes on you get less and less return but your costs rise. In all projects as time goes on the rate escalates. In Vermont we are just starting at a higher rate.

If the dairy farms take a percentage of the revenue would they be considered an owner, than that tax equity partnership would partially shift to the farmer so that the partner couldn't realize all of it. Could effect other tax scenarios.

Interviewer: Other physical concerns regarding development on dairy farms?

Maintenance would be responsibility of owner of system

2.2MW would be between 10-12 acres

3 phase power is crucial and connection costs influence feasibility real quick

Interviewer: What do you think is the biggest challenge for the success of this program?

Guerin: The biggest challenge for the developer is finding a tax equity relationship. If there are not organizations around to support a system like that its not going to work.

2. Interview with Chad Farrell of Encore Redevelopment on 3/11/2010

Interviewer: What do you think about the current SPEED program and the proposed dairy-farm solar power initiative?

Farrell: The amendment sounds great.

As you probably know, the subsidies are over subscribed. We submitted 5 sites but were not accepted. We are looking to develop 5 brownfields now. No one is really using landfills and super fund sites. This is where the developments should be focused

I have been talking with Jenny Ryans about the FIT program. The amendment should look into expanding upon the current tax credit opportunities, especially on contaminated sites. Landfills don't have any other issues, but would work fine for solar. There should be incentives specifically for brownfields.

Interviewer: How has the permitting process been?

Farrell: Manageable.

Interviewer: What do you think farmers would think about the proposed amendment?

Farrell: We are talking to a number of farmers now, smaller net-metering projects. More community scale, looking for a couple acres of land, they get a fixed price for electricity. The farmer's biggest issue would be getting knocked out of programs.

Maintenance would be the developers' responsibility. The fee for maintenance would be built into the yearly operating costs. It would be owned by an LLC and maintained by the ELC.

Dual land-use is a definite possibility.

Three phase is crucial. It doesn't make sense to pay \$1 million in connection technology for a \$6 million project.

3. Interview with Naoto Inoue from Talmage Solar on 3/11/2010

Interviewer: What have been the biggest obstacles to your solar development projects?

Inoue: The biggest issue with the SPEED program is the permitting process. Specifically the environmental impact study. 248 B & J have proven difficult to navigate; J requires a public hearing but B doesn't.

The permitting process has significant requirements. It requires the developer to assess the

potential for groundwater contamination. The developer needs to prove that it is not one contiguous surface but ground mounted arrays are not one contiguous surface. 248 B & J treat solar as if it were nuclear and this is causing a 6 month delay in the project. The permitting process was likely intended to manage nuclear facilities and there should be an exception for solar.

Interviewer: Benefits to farmers from the Dairy Farm – Solar Power Initiative?

Inoue: Photovoltaic cells are an opportunity for Vermont dairy to improve their business by operational cost fixing. Dairy farms have to allocate funds to deal with two significant issues: volatile prices for raw milk and volatile electricity costs. If one sector of operational costs could be predicted (electricity), they could spend excess income on the other operational costs. Electricity costs almost never decline. They have increased a minimum of 4% annually in New England.

Also, the farmers will certainly make a good wage from the solar power development. If you install solar in Vermont you are ensured 4 ½ hours of sunlight even on the bad days. We can pretty accurately predict how much solar energy a site will be able to produce over time. The panels will produce 85% of their original output at 25 years of use; this is highly unusual for technologies (he then did a back of the envelope conversion with a simple example to display how certain solar's benefits are).

With the standard offer, farmers are guaranteed to get roughly 24% less operational costs. This is the economic benefit, it makes absolute sense.

Interviewer: General concerns with the bill?

Inoue: Unsure why the bill restricts the developments to 2.2 MW. It will take roughly 14 acres for a ground mounted system to accommodate that energy development goal. The attitude ought to be if we want to bring green energy into the forefront, let the private sector handle it. If it was a 50 cent/KWh system there would be half-gig projects popping up everywhere.

Vermont is referred to as hippy dippy, the whole idea of environmental protection and anti-big business. There has to be a certain amount of trust that those in the solar business will behave in an ethical manner. We have to catch up with Europe and Japan and cut down fossil fuel dependency. They are planning to have 20-30% sustainable energy by 2030. We have less than 1%.

Talmage has to incur unnecessary costs. Why are the projects limited to 2.2 MW? If they encourage faster development by higher rates, it's ridiculous that they limited the projects. Many of the projects in the SPEED program are just not being seen through - a lot of hydro projects have been dropped. These unused subsidies need to be reallocated to new solar developments.

Interviewer: Can you imagine any further obstacles to the farmer in regards to solar development?

Inoue: 3 phase power and a significant amount of transmission.

Don't see the losing side for the farmer in the leasing deal. But once again, I don't think it should be mandated. If it gets mandated then competition won't happen, need to allow creativity to happen.

From the dairy farm's perspective, income sharing would be the best deal for financing, not a system in which the developer leases land at a fixed rate. This would be most fair. Farm-

ers would understand this and be okay with income changing seasonally, that is their life. The deal would have to take into account the changing weather conditions. The language of the deal should allow for freedom to adapt.

Technical issues will depend on the local environmental regulations. That will determine how much disturbance we make. With proper soil we can ensure not to cause more than 1 acre of disturbance (not sure what scale he is referring to here).

The slope if the surface makes a difference, as well as the access to the grid.

Interviewer: General opinion on solar development in Vermont?

Inoue: We are the only solar company that was awarded a SPEED slot. Everyone else was a real estate company. The FIT program provides incentives to those who know how to make money, real estate developer have land and know how to make money off of it. WE are not in the mentality of just installing the system. Mary Cheyney and Tony Cline have been the primary movers in solar development. They had to negotiate and compromise to get what we have now.

Until we get political help its extremely difficult because we are fighting against entrenched technology. It's almost impossible to break into the business.

Appendix C: Interview Transcripts and Summaries – Other Stakeholders

1. Interview with Dennis Schaffer from the Vermont Land Trust on 4/07/2010

Interviewer: Could a dairy farmer with his land conserved under a VT Land Trust deed enter into a contract for solar development as proposed by the bill?

Dennis: You have to look at the electricity that would be produced by that project, because... We allow a project if the energy produced is for on-site consumption. Our rule is that at least 50% of the energy produced must be consumed on site; then we allow the project. So generally we don't allow projects that are set up for commercial production.

Interviewer: So as long as that is true, a farmer could develop a project anywhere on his land? Even if that land is cropland?

Dennis: A project must not be in conflict with the program's conservation values. We consider, for example, conserving prime ag soils.

There was an example of a farmer wanting to do a project like this in the Waitsfield area, in Warren. He wanted originally 12-15 solar panels and wanted to produce for commercial consumption, but we had to tell him that that's just not possible with the land under the conservation easement. So he cut it down so that he would be producing for more on-site use. But then he was picking a site: a good sun location in the middle of his field (and it's a small field/farm). That was going to have a major impact on his primary agricultural land. So we had to work out with him a better site.. "No, you couldn't have it there, but maybe on the buffer of the road, out of your field..." We were able to find a site on his street buffer off the field that we could all agree with.

So it's really a matter of working together to find a solution that works and is not in conflict with conservation values. We can get a yes as long as there is a site that doesn't threaten the prime ag soils.

There's another question of producing for community-scale use, and how we would deal with projects through a local municipality program. We're still grappling with it; figuring it out.

Off-site sales of power; commercial generation is something we don't permit.

If there is a new farmer coming into the VT Land Trust program, and they already have in mind a new project to set up on their land, we try to work with them to exclude that land they're considering from the conservation program, so they don't have to deal with it conflicting with the land trust easement.

Interviewer: Let's say a farmer did want to go through with a commercial project. Would just that land used for the project be removed from the land trust program, or his entire farm, or what?

Dennis: When farmers set into a contract with us to conserve their land, we have a deeded right; we own an interest in that land. We can't "remove" property from the program. It's an ongoing agreement, and the easement runs in perpetuity.

What we would rather do is make sure there is a significant exchange of conservation values;

if we experience a loss, there has to be a gain somewhere else, in additional land or something like that. It's unlikely we would be in a situation where we would say "to accommodate that kind of use of the land, let's remove that land from the program." Maybe someday we'd figure out a way where if a commercial project has no impact on conservation values, it could be compensated.

Interviewer: What if a farmer is producing an amount of electricity which is fed completely into the grid? If they are still using 50% of the amount produced, even if that electricity is coming from the grid and not explicitly from their production, would that be acceptable?

Dennis: I don't think we've come across a situation like that yet. Though I understand what you mean, that it would be fed into the grid, so the electricity is not necessarily coming from their own electricity production. If that were the case, well—it seems like it would be consistent with our values. That's what I can say reacting to it. We would have to think about that.

When a farmer enters into a deed with us, they have given up certain rights on their land; given up the rights for non-agricultural commercial enterprises on their property. So to use the site to get income on the farm for a non-ag. enterprise is restricted in some way.

In a declining farm economy where all farmers are struggling to make end's meet, they're understandably going to be attracted by leasing their land to solar development and getting extra income that way. But if it's conserved land, it comes down to the fact sometimes that you just can't do that. And other times it will be a case of allowing a project only if it can be done in a certain way.

Interviewer: How do you deal with changes in land ownership and land use? What happens if a dairy farmer goes out of business, for example?

Dennis: The deed runs in perpetuity no matter if it changes hands; the terms of the easement stay the same. We make sure that new owners understand the terms of the easement. Easement always runs with the property. Land changes all the time, and so we have a lot of experience dealing with this.

2. Interview with Craig Miner from the Addison County FSA on 4/22/2010

Interviewer: I know with the Vermont Land Trust, there is some leniency regarding solar development, but it ultimately conflicts with the VLT contract. Would development of solar on dairy farm land come in direct conflict with CRP contracts?

Miner: Well, there's more land in VT covered by the Vermont Land Trust. There are about 115 CRP contracts, but most of that CRP land is along streams in areas that are not conducive to solar development. It's only about 4 to 5 acres total and about 100 ft on each side of a stream.

If you wanted to put it there, which wouldn't make much sense, it would come in direct conflict. CRP is for planting trees in all cases as a buffer meant to be for conservation. You are required to keep animals out of the area. So yeah, I wouldn't think it would be allowed.

For CRPs in other parts of the country where they use whole fields, that would be a good question.

Interviewer: So, Vermont doesn't have whole field CRPs?

Miner: There are a couple of contracts, but for the most part CRP land is riparian buffers in VT. You might get an old potato field up in Maine that's eroded and turned to conservation land. So no, we don't have whole field CRPs in VT.

3. Interview with Bob Parsons, UVM Dairy Economist on 4/02/2010

[I describe to him the bill and our main questions—about appropriate leasing rates, etc]

Parsons: How long would the contract last?

[I believe the length of contract between developer and farmer are not constrained by the bill, but in thinking about the 10-25 year term of the standard offer, I said 10-25 years ...Bob chose a 20-year contract as an example to talk about cons of long contracts locking up the land].

Parsons: So you're locked in 20 years and rates for renting land runs from nothing to \$100/acre. The answer to your question really depends on the acreage of the dairy farm...

One of my first questions is, [if I were a dairy farmer,] do I have to be in dairy the full 20 years [of the contract]? What if I go out of business? Or if I was renting my land to a neighbor, would I still be eligible? One thing I don't understand is, why just dairy? Why not farmland in general?

Interviewer: Another question is, does the farmer pay for infrastructure?

Parsons: That would be up to the developer and farmer—they would work out who paid for the infrastructure.

There also may be some siting requirements; I know solar does well with a southern approach, for example, but would it work on a rocky hillside? Or on some bottom ground? A rocky hillside doesn't have many alternative uses, so that might be good site.

One way you might figure out what has to be true about a dairy farm for the H-518 contract length is to look at how land and landowners are dealt with in other federal or state conservation programs. Let's say I sign up land for a conservation program, like wetland protection through the NRCS. And this program has a 15-20-year contract. There would be certain things that would have to be true over that time period, I would think. You could look at these contracts, and see what has to be true over those 20 years.

So to make leasing your land for solar development economically feasible over that long contract time, the rent must be attractive. One way to do that is to tie it in with inflation, so that there is an increase in rent per year with inflation, and no decrease in the rate of returns.

Another thing you'd have to consider with a 20-year contract is what happens if either the developer or dairy farmer back out. You'd need a rider on the deed that makes sure that if a dairy farmer sells his land, the solar panel owner can keep the solar panels themselves; you'd need some inclusions on the deed.

Also, if the developer goes bankrupt or backs out, I as a dairy farmer want to know what will happen to the land; will the solar developer return in to its original condition? For example, do those

solar arrays need their posts concreted into the ground? And if the developer goes bankrupt and leaves, will the developer keep those concrete posts sticking up? I want to make sure that the land is returned to its original condition so that I can farm it again, or use it as I used to.

One way to consider the economics of choosing to lease land is to look at how the conservation programs appraise the land. You could call up the NRCS and ask, how do you figure out the payment for land in the conservation reserve program, or the wetland protection program, etc.? Because dairy farmers that sign up, they will be paid so much an acre, over the years. Just to have it conserved.

So when considering leasing land...If I lease you an acre of ground close to the road, where you don't have to go through the farm to get to it—an acre I'm not using, and you'll pay me more than I'm currently getting [and more than a conservation reserve program would pay], that seems attractive. Otherwise you would need an access road and that means tying up that ground as well as the land for solar panels.

Solar is also different from a cell tower b/c that's an eyesore. I know a dairy farmer who is paid \$200/month for a cell tower on their property, because of the aesthetic cost of it being there. Also, is this a violation of Act 250??

Interviewer: The bill protects against being bumped out of Current Use by making solar development on dairy farms exempt from the definition of "development."

Parsons: But if I'm not a dairy farmer, I can't develop solar on my land? This leads to another concern [regarding the definition of dairy farm land]: Usually when dairy goes out of business, neighbors take care of it. So it's not dairy anymore? Could that still be used for the development of solar? What defines "dairy farmer"? How does it change if a neighboring farmer takes up that land?

If you are leasing 1 of acre land for 5 years, or 20 years, renting essentially means buying, because the farmer can't use that land for anything else, it's tied up. When leasing long-term, you're basically selling that land.

Would solar panels be eyesores, like cell towers are considered to be? [Would they need to be compensated extra for this cost?] Some people think solar is interesting, some people think it's ugly, so a question to ask is, what does having solar on your land do to the value of the rest of the land (farmland)?

In terms of leasing, I would want more than what I get just for farming, because that land is tied up [opportunity cost included in lease price]. If I was offered \$200/acre, well I've never made \$200 off that ground, and won't in the foreseeable future. I don't intend to sell the farm in the next 20 years. That seems really attractive. The question is really, what is the piece of ground worth to you? Cell towers need very specific sites. They pay high because alternatives are not many. It might be different for solar.

Let's say a farmer is offered \$1000/year for 5 acres right next to road. And they felt secure that the developer would return the field to original state if the developer pulls out. With that kind of rate, you'd likely see competition between farmers [to be hosts]; they'd be willing to talk about several different locations on the farm, perhaps. But that's a piddly-squat amount. That's not going to keep dairy going. Now 15 [thousand, maybe? Or 1500 probably], I could see that keeping dairy going.

Lease rates really differ across the state. There's a lot of unused land down in the southern part of the state. Near St. Albans you can get \$100/acre, but then near Middlebury you'd probably get \$50/acre. Then from Rutland down you see a lot of people that allow neighboring farmers to just use their land for free in exchange for keeping it maintained/just

cutting the grass.

There's lots of land in state that's not doing anything, just sitting there. If you put an ad in the paper that you'd pay \$1000/year for 5 acres, you'd have a [large] choice of land.

Again, [don't know why it's just limited to dairy]. Just because I have cows, it doesn't mean it's the best land for solar. It may be different land that's more suitable for solar development.

Another thing to consider is that many farmers have a mortgage on their land. I would really recommend you talk to the lenders in the state to get a sense of their demands in response to a project/contract like this.

You could talk to:

Farm credit office in Middlebury

Yankee farm credit

Gary Broman –farm service agency

If farmers enter into a long-term lease, they can't do it without the approval of their mortgage holder. You could run the proposed contract for development by a lender, and see what they say. Would a lender have any objection to the farmer leasing their land? Who would have say on the use of that land, etc.? If the farmer signs into a 20-year lease for 5 acres, is there any problem from the lender's point of view? Whether such a contract/such development would lower the value of the farm at all is going to be one of the main concerns of the lender. They hold the collateral, and may have to repossess that land someday. The lender may request payment (for the leased land) comes to them rather than the farmer. They have ultimate say.

Interviewer: How many dairy farmers have a mortgage on their land?

Parsons: 30% of dairy farmers were out of debt prior to a few years ago. But last year there were more debts taken on. A farmer is always in some kind of debt. That's just how business is, that's how it works.

The number of people with a mortgage is more than 30%, but even those with their mortgage paid off have some other kind of debt.

If I'm a solar developer, I want to make sure that lease is still good even if the landowner dies. This would have to be written in to the deed.

You'd also want to ask the Vermont Land Trust whether these farms can enter into such a contract if they are in a conservation reserve program, where the farm can only be used for agricultural purposes (normally). Deeds tend to be written up only for agricultural production, even if a leasing makes the farm more viable.

Interviewer: Getting back to actually calculating whether a farmer would even want to convert his crop land to solar development—how can you calculate the worth of an acre to a dairy farmer, or how much money is made off the land through growing crops?

Parsons: You'd look at the crop budget, which each farmer normally has record of. You look at the returns on a ton of corn silage; multiply that by the yield. I doubt it's more than \$100/acre for corn silage. There are a lot of expenses to produce that corn silage.

Let's say you get 18 tons/acre, and the returns on that corn silage are \$30/ton. That's \$540 gross. Gross. It costs a lot to put out the corn and harvest it.

There are Extension crop budgets available (on an annual basis) to get an idea. 20 years lease—essentially selling that piece of ground.

In some areas of the state, getting additional land isn't that much a problem. If you pay me enough to take 5 acres out of production [from my crop fields], I could rent land close by for \$50/acre and produce that corn silage [that I used to produce on my land] on that rented land.

You said you talked to Audet about this? You might want to ask how much land Blue Spruce actually rents. I know they rent a lot of land. Can solar be developed on land that the Audets rent? Or only on that land that they own?

There are lots of non-farming landlords out there. If you see barns without cows surrounded by crop fields, that land is being used for corn silage, but it's being rented.

Why would it have to be just dairy farms? I can see this program being a good option for family farms that want to keep the farm in the family but are not running the farm anymore—a way to keep it in the family, and keep it viable.

Interviewer: Would the relationship with the developer be based solely on leasing?

Parsons: That is up to the developer and the farmer. It seems that it could strictly be a lease agreement or there could be an agreement such that the farmer also obtains some of the revenue from electricity produced...Is it like leasing for natural gas rights? Would a developer really want to share the revenue? I mean, they're essentially seeking out land. I would assume that their largest costs are those upfront capital investments for the actual solar arrays, not the price of land.

What problem is the legislature trying to solve? Are developers saying "I wish I could do this but for this obstacle?" Is it trying to solve a problem that actually exists? How would it help? It's green energy, sure, but green energy is expensive, and we can only make it viable through huge grants. We already have net metering laws so we make sure farmers get a good price for electricity.

But is that the best use of my tax money?

We're ignoring all the initial grants it takes to make it viable (personal view). If we get more farms going, we could help make it cheaper and more applicable for other dairy farmers, but is that the role of the federal government, or the small state of Vermont?

A lease agreement that promises \$200/acre/year with inflation considered should be attractive to a farmer, but there's a personal price for a developer using the land (should they pay a farmer more?). And a farmer should consider how that development will affect the value of the land.

And what does the developer know about what revenue is being generated? Should the farmer take more? Ask for more? It's tough to know. Farmers may be apprehensive that someone will make a fortune off the solar panels, but the developer may not actually be making a fortune.

4. Interview with Claire Ayer, Middlebury Senator on 4/2/2010

Interviewer: What are programs that dairy farmers may be involved with that could conflict with H-518?

Ayer: 3-phase is a big deal for connecting to the grid. Those without 3-phase would have to put out a lot of cash to establish the infrastructure. So those farmers already involved in methane generation would already be able to connect to the grid, and would remove this up-front cost.

Current Use is one program. This pays for the tax on a farmer's land as long as it stays in current use. We set the value of farmland each year based on the price of milk, etc., [and the taxes are paid off accordingly.] We always tax at the rate that a farmer can make money on the field. That's calculated each year. This land value is set for forest land as well. Farmers have to pay 10% of fair market value of the land if that land is taken out of the current use program.

Interviewer: What if the farmer has sold their development rights of the land that belong to the state, such as to the Vermont Land Trust?

Ayer: Then the development would be prohibited.

The conservation reserve program is all about how you crop your land. If a land owner doesn't crop the land, they wouldn't get this program.

This bill is all about trying to diversify the energy portfolio in the state, and create value for the farm economy.

There is also a wildlife habitat incentive program. If a farm were to develop solar on their land, they wouldn't be eligible for this, because if you have wires going across the land, or a lot of infrastructure or roads cutting through the land, you're not eligible.

Legislations—we do a lot. We designate millions of dollars to state programs to help with farmers' loans.

Right now dairy farmers don't have any leverage. There's just too much milk and they have no control over the price. We hope they can weather the storm, learn to diversify, and still maintain the working landscape.

Interviewer: Why does H-518 focus on supporting solar development in particular?

Ayer: We are trying to find a way to help dairy farmers make money, help them with investment, and/or guarantee a rate. With methane digesters, farmers have to invest a lot of their own money.

And farmers have a lot of good space for solar panels on roofs, it just seems like it makes sense.

Interviewer: I've heard concerns from developers that old dairy barn roofs might not be stable enough structures to carry such expensive and heavy solar equipment.

Ayer: Well there are definitely innovations out there. I've heard some about an actual roofing material that has photovoltaic cells in it that looks like tarpaper. This would be an alternative to the big solar panels.

I also just remembered that farm buildings are also in Current Use. And the tax debit is its agricultural value. If a farmer adds something that makes money on the roof, we'd have to consider how that would work.

But really any solar development is going to be defined as development, because anything with electricity and plumbing = developed. If we were to excuse this in H-518, there would have to be all kinds of new legal work.

5. Interview with Paul Stone on 4/12/2010

Interviewer: What is your opinion of the bill?

Stone: My representative is Will Stevens. I wrote him a letter a few weeks ago about my complaints. He hasn't written me back. He usually does, but...

I have several problems with the bill.

1. It singles out dairy farms. A lot of legislation singles out dairy farms, and leaves other farms flapping in the wind. This is one-sided. They could be thinking about farms not dairy farms only.
2. Solar is not economically feasible without a subsidy. I used to be for it but I'm against it now. It's so inefficient. Money could be better spent on energy conservation.
3. Farms have to be 3-phase power. That eliminates 75% of farms, perhaps more. If you don't have it, it will be very expensive to have 3-phase power installed. So there's a limit to dairy farms, and a limit to 3-phase farms. That's an unfair way to go about it.

Back to my point about energy conservation: this is the basis of where we should be moving. There have been some good things in the last few years, moving in this direction. "Efficiency VT" (EVT) is one example. Through EVT, you can support [energy conservation] by paying a monthly fee. We have a farm. We raise X number of turkeys/year and we grow hay. No more dairy, like we used to. We have X number of buildings, and land. Because of all this, we put \$1200/year /year into EVT. People with a house pay less, something like \$40/year. This money is used for conservation projects. It helps save all forms of energy. Energy conservation is much more effective than subsidizing the production of electrical energy. There are many examples of this. For example, even back in 1984, there was an insulation project for [our?] house, caulking the cracks, putting in insulation in walls, etc. We heat the house 25 years later with relatively low cost compared to other buildings.

So energy conservation is definitely a first priority. The State hasn't gotten serious about conservation. There have been some efficiency programs with lighting, caulking windows, doors, etc. and we have EVT, but the standards the State has set are very low. Even insulated houses are not "super insulated."

Also, each town in Vermont has its own zoning requirements, which adds up to 260 different approaches. And almost all towns have no building codes, though that's where you would enforce energy conservation. Maybe Burlington or Rutland have them, but I know Middlebury doesn't have them.

Interviewer: Energy Conservation may be your first priority, but what would you say to the need to replace the energy produced by VT Yankee in the coming years? What are VT's options for doing that, and how should it be replaced?

Stone: There's Hydro Quebec: I have no problems with it. I understand the concerns about Cree Indians being thrown off their land. But it's built now, so we might as well use it. I don't have any problem with hydro power. You know there have been a couple VT dams torn down to let rivers go back to their natural state.

Any project that can come close to making money—with a small subsidy—is a good thing. And I think over time, solar and wind will have lower capital costs. [So that may be more feasible in the future]

But in terms of replacing VT Yankee, utilities say they have other sources. Natural gas is one—it comes from Canada, it's fairly inexpensive, and fairly clean. We'll probably use that. VT Yankee has done themselves in. They're out. But utilities seem to think they'll have base-load power at a fair/reasonable cost. The state and public service board have to figure out where we're going to get the power.

There are new innovations coming along; I heard on 60 minutes the other day about a new technology being developed in California. It has a funny name, something like "Boom-box" or something. It turns gas, natural gas, and possibly even methane into electricity, efficiently. The best thing about it is that it can turn different kinds of gases into electricity. There are examples of 2 or 3 big office buildings with the technology, and you don't see the boom-boxes, or whatever they're called. They don't look bad, and are quiet.

Methane digesters are a good thing to subsidize—they produce electricity, but are solving environmental problems too. Farmers have to manage their manure somehow, you know. Biomass research with willows is interesting. It might turn out that this technology is successful, and we could develop that more. It wouldn't be the beautiful landscape like we have now, in my opinion, but...

One resource we do have is forests. We only use 25% of forest production/year right now in Vermont. So there is a lot of potential for wood-fired heating or electricity generation from wood.

Wind power is another option. There are a few wind projects proposed in Rutland county, and people are pretty upset about it. I'd love to see windmills all over the place. People want their electricity, but they just get stuck on one thing—they get stuck against one thing—and they stay that way.

Interviewer: What do you think is the role of the state in developing alternative energy, subsidizing technologies that are not yet economically feasible without a subsidy, etc?

Stone: The state should definitely be involved in developing solar technology and other alternative energy technologies. You know CVPS? They just put up a solar project at their headquarters. They just put it up, so I don't know what kind of energy they're getting from it. I worry about the sunshine we get in VT—which isn't very good.

Interviewer: What do you know about other state programs that dairy farmers are/could be involved in that would be in conflict with a program like that proposed by the bill?

Stone: No conflict I'm aware of—with different programs. We've conserved our land, but we could put up a windmill or solar. I can't put solar in my fields without permission from the conservation reserve program board, but I can't imagine they would deny permission.

Interviewer: What programs are you exactly involved with?

Stone: We're in several programs.

- 1) We sold our development rights to the Vermont Land Trust. That means that we conserved our whole farm, all land, everything. All the land right around our farm buildings—that's called "farmstead." We can build more buildings there, put up windmills, whatever. Through this program, the land is protected and [the taxes are paid for] by a combination of the Land Trust and the state.
- 2) CRP (Conservation Reserve Program): this involves farm land. This is a federal program. It puts marginal land into conservation projects temporarily or for long term.

We have land along Otter Creek over toward Brandon, and we put all the productive fields in the CRP, for a 15 year period. They pay for us planting trees, and we can harvest these eventually. This allows all that land along Otter Creek to turn into forest.

A branch or extension of this program is the CREP (Conservation Reserve Enhancement (I think) Program). With this program, the State gets involved. The state puts in a little money to incentivize involvement in the program.

These programs are for marginal (and good) land; sometimes it's just protecting farmland in a current state over a period of time. It requires just a little maintenance and then the owner can farm the land again at the end of the duration of the program.

There are lots of other federal programs...

Interviewer: You mentioned that you could put up a windmill or solar panels on your agricultural fields if you got permission. What is the line between these projects and actual development on your land?

Stone: [If you took out 5 acres of cropland] and put up solar panels, that would definitely be development. You would definitely have to go through Act 250 in that case, and that would definitely be "development" under the terms of the CRP.

You might also have to go through Act 248, which is a similar act for power generation.

Interviewer: What would an ideal alternative energy bill look like in your opinion?

Stone: We should be careful about subsidizing things...the State has made a big mistake in the past. When the latest Alternative Energy Bill passed—the SPEED program—they had a kind of lottery for the projects. But you know who got all of the bids? It was all big developers and companies from out-of-state. All of us wanted to participate, but we didn't get in the auction. There was some sort of online system and the first people to get their application in got the bids.

Interviewer: I thought that the State was reviewing the projects for feasibility...?

Stone: You'd like to think that some of that was going on, but it was really those big companies [that were able to front the big capital costs, etc.] that were able to secure a spot. It was just first come, first served.

The SPEED bill subsidized different technologies at different rates, over a long period of time. And this ends up costing ratepayers a lot of money. The electricity from these technologies is sold at 20 cents a kWh to power companies, whereas electricity from Hydro Quebec is sold at 6 cents per kWh to these utilities. With this SPEED bill our bills go up and big corporations are supported,

for those are the people that can get in the game. The average Vermonter doesn't know that much about what happened. I thought great, I'll put up a solar panel... But that's not how it works.

At the same time, any alternative energy that makes economic sense should be considered. Methane is really something that could be good. Currently methane digesters only make economic sense for a certain size farm, but there is good stuff going on experimenting with new designs and technology. Dan Scruton, who works in the Vermont Agency of Agriculture, is working on this research, and looking at new alternative methane digester projects; experimenting with methane, 2-3 things going on in VT. His phone is 828-2500 or 828-2430

Dan is in charge of a program in the Agency of Agriculture that gives grants to have a feasibility study done on your farm to determine what might work in terms of alternative energy. We have a grant—and we're doing a feasibility study. Wind and solar aren't feasible for us, but we heat a lot of water for turkeys, etc. So we wonder, what about a wood-gasifying furnace to heat the water? We have a lot of woods—200 acres of woodland. We're not talking about a biomass digester like the one there at the college, but rather one that costs something like 40,000 dollars.

This feasibility grant program is a program that makes a lot of sense. Farmers can study their individual situation. For me, I found out that even with all my buildings, solar is not feasible.

6. Email Correspondence with Martin Bowen, III of CVPS

Email to Bowen on April 5, 2010:

Hello Mr. Bowen,

My name is Linsey Haram and I am a Middlebury College student in the Environmental Studies Seminar class, which came to visit you earlier this year. As you may remember the ENVS state team is working with house representatives to potentially develop a solar energy-dairy farm initiative for the state of Vermont. A very important aspect of determining its feasibility is understanding the hike in prices that will occur for other ratepayer, whom are not directly benefiting from this initiative. Thus, I have a very brief, theoretical question about the increase in price for ratepayers following the implementation of solar power:

If all 50 MW allocated under the bill were developed in your region how much would the price increase for all ratepayers? What if only a portion was developed in your region - say, 12 MW?

Your insight would be incredibly helpful. Please let me know if my question is unclear. Thank you so much for your time.

Best,
Linsey Haram

Response from Bowen on April 5, 2010:

Well, lets make some assumptions and try to figure it out.

If we assume the average wholesale price for energy is around \$0.06 (6 cents) and the FIT will be paying \$0.30 (30 cents) you can calculate the increase in cost for the energy.

If we calculate the energy produced by 12 MW of solar in Vermont, assuming 15% losses and federal NERL average solar radiation exposure of 4 then we get 14,892,000 kWh per year ($12000 \times .85 \times 4$)

Now if you multiply the cost difference of solar by the annual kWh energy you will get the additional cost for solar. If you then divide that by the approximately 152,000 CVPS customers you will get an average cost increase per customer per year. Divide that by 12 to get the monthly increase.

Now you can also assume if the average residential customer bill is about \$70 (for 500 kWh), then what is the percent change?

This will get you a rough idea using assumptions and averages...

What did you get for numbers? Tell me what you got and I will tell you if it is close to what I got.

Martin W. Bowen III, CEM

Customer Generation Program Manager
Central Vermont Public Service
Tel: 802-747-5270
Nbowen@cvps.com

Response from Bowen on April 6, 2010:

I came up with just a bit over 2.5% and about \$3.5 million annually or just under \$25 per electric account if spread evenly...

Oh by the way, that \$3.5 million is \$87.5 million over the 25 year life of the contract

Also, since CVPS covers 75% of the state's land area and about 55% of our population, it is likely that over 50% of the generation would be located in our service area. The above numbers assumed 12% of the 50MW in CVPS territory when in fact it may be closer to half or 25MW so double the numbers above for CVPS customers.

Martin W. Bowen III, CEM

Customer Generation Program Manager
Central Vermont Public Service

Appendix D: Survey and Interview Questions and Contacts

1. Survey Distributed at the Middlebury Green Energy Expo on 3/21/2010

Solar Power on Vermont Dairy Farms

The Agriculture and Natural Resources House Committees are discussing a program that would allow solar developers to receive subsidies on electricity produced from solar technology—if they develop on land owned by dairy farmers. The dairy farmer could invest in developing the solar to diversify his or her income, or a separate investor could lease land from the dairy farmer.

Here are some possible factors that may affect the success of this proposed bill. How much of an effect do you think these factors would have?

1-No effect
2-Small effect
3-Moderate effect
4-Large effect
5-Very large effect
x-Not sure

- | | |
|--|-----------------------|
| 1. Aesthetics/appearance of solar panels | 1 / 2 / 3 / 4 / 5 / x |
| 2. Grid connection (connecting to electrical lines) | 1 / 2 / 3 / 4 / 5 / x |
| 3. Financial incentives to the land owner | 1 / 2 / 3 / 4 / 5 / x |
| 4. Financial incentives to the solar developer | 1 / 2 / 3 / 4 / 5 / x |
| 5. Interest of dairy farmers | 1 / 2 / 3 / 4 / 5 / x |
| 6. Effect on the promotion of solar development in Vermont | 1 / 2 / 3 / 4 / 5 / x |
| 7. Disqualifying farmers from other existing State programs (example: Conservation Easement) | 1 / 2 / 3 / 4 / 5 / x |
| 8. The development of farmland | 1 / 2 / 3 / 4 / 5 / x |
| 9. Responsibility of farmer for maintenance of equipment | 1 / 2 / 3 / 4 / 5 / x |
| 10. An increase in price of electricity to the rate-payer | 1 / 2 / 3 / 4 / 5 / x |

As the bill is described above, would you be in support of it?

Yes / No / Maybe why? _____

What town do you live in? _____
Are you a solar developer? Yes / No
Are you a dairy farmer? Yes / No

Thank you for your time

2. Dairy Farmer Interview Questions

The Vermont Agriculture and Natural Resources House Committees are proposing the development of a program that would allow solar developers to receive standard offers for commercial solar production if they can develop on dairy farm land. The dairy farmer could invest in developing the solar him or herself or could lease land to a separate solar developer.

1. What might be the pros/cons of this type of program? Why?
2. What elements would have to be incorporated into the initiative in order for you to participate? 2a. In that case, would you be likely to participate?
3. If you were to participate in this program, how would you be most likely to participate, as a leaser or as the developer of solar?
4. If you could develop any (other) energy technologies on your farm, without worrying about economic cost, what would they be and why?
5. Are you involved in any programs that might make you ineligible for solar development on your farm? If so, what? Conservation Reserve Programs?
6. Have you ever considered installing solar on your land?
7. What is the size of your operation?

3. Phone Interview Contacts and Responses of VT Dairies

FARM	TOWN	RESULT
Starlight Farm	Alburg	Message
Phelps Farm	Grand Isle	No Number
Joneslan Farm	Hyde Park	Message
Kaiser Family Farm	Stowe	RESPONSE
Keewaydin Farm	Stowe	RESPONSE
L&L Farms Inc	Morrisville	Message
Lanphear Farm	Hyde Park	No Number
Circle Saw Farm	Braintree	No Number
CR Farm	Newbury	No Number
Green Acres Milking Shorthorns	Randolph Center	No Number
Harkdale Farm, Inc	Newbury	RESPONSE
Howacres	Tunbridge	No Number
Howvale Farm	Tunbridge	RESPONSE
Newmont Farm	Bradford	Message
Silloway Farms	Randolph Center	No Number

Smith Farm	Topsham	No Number
Sprague's Dairy Farm	Brookfield	Message
Vaughan Farms, LLC	East Thetford	Message
Wakefields' Meadwobrook Farm	West Brookfield	No Number
Allandra Farm Inc	Vergennes	No Number
Arbutusland Farms	Orwell	No Numner
Blue Spruce Farms	Orwell	RESPONSE
Bodette Farm	W. Addison	No number
Bolduc Farm Inc	New Haven	No Number
Chalker Farm	Vergennes	No Number
Cher-Mi Farm	Orwell	RESPONSE
Clifford Farm	Starksboro	Message
Crazy Acres Farm	Vergennes	Didn't want to talk
DeVos Farm	Ferrisburgh	No Number
DeVries Dairyland	Addison	No Number
Elgin Spring Farm	New Haven	Message
Gosliga Farm	Addison	No Number
Green Valley Farm	Vergennes	No Number
Hog's Back Mountain Farm	Starksboro	No Number
L&LT Farm	Middlebury	No Number
LaDuc Acres	Orwell	No Number
Ledge Haven Farm	Orwell	No Number
Monument Farms	Weybridge	RESPONSE
Nea-Tocht Farn	Ferrisburgh	Message
Norton Dairy	Norton	No Number
Routhier & Sons Inc.	Bloomfield	Message
Russo Farm	Brunswick	RESPONSE
Aires Hill Farm Inc	Enosburg Falls	No Number
B&T Black Creek Farms LTD	Enosburg Falls	No Number
Ballard Acres	St. Albans	No Number
Beaulieu Farm	Swanton	No Number
Bessette Farm	Highgate Center	No Number
Bourbeau and Sons	Sheldon	Message
Brouillette Farm	Sheldon	Message
Carman Farm	Swanton	Emailed 4/13
Brotherly Farm	Brookfield	Emailed 4/13
Stony Pond Farm	Enosburg Falls	RESPONSE
Glen-Mar Dairy	Castleton	RESPONSE
Dunstable Farm	Cabot	RESPONSE
Liberty Hill Farm	Rochester	RESPONSE
Pearlmount Farm	Barnet	RESPONSE
Rainbow's Edge Farm	East Burke	RESPONSE
Taylor Farm	Londonberry	RESPONSE
Simplicity Farm	Waitsfield	RESPONSE

		RESPONSE
Gervais Family Farm	Enosburg Falls	
Milky Way Organic Farm	Rutland	Message
Woodlawn Farm, Inc.	Pawlet	Message
Fairmont Farm, Inc.	Montpelier	Message
Thistle Hill Farm	Pomfret	Message
Maple Hill Farm	Whitingham	Message
Loan Oak Farm	South Royalton	Message
North Hardwick Dairy	Hardwick	Emailed 4/13
Tamarlane Farm	Lyndonville	No Message
Hindsdale Farms	Charlotte	Message
North Williston Cattle Company	Williston	Message
Riverside Farms	Richmond	No Machine
Twin Oaks Farm	Charlotte	Message
Willow Hill Farm	Milton	No Message
Dean Hook Farm	Guidhall	No Message
Richardson Family Farm	Woodstock	No Message
Blue Top Farm	Highgate Center	Message
Trudell Family Farm	East Fairfield	Busy
Riverview Farm	Swanton	Didn't want to talk
Pine Valley Farm	Shrewsbury	No Number
Richard Hulett & Sons	Pawlet	No Number
Long Field Farm	Cabot	No Number
Carpenter Farm	Cabot	No Number
Spring Brook Farm	Reading	No Number
Cedar Acres	West Haven	No Number
Walden Mountain Dairy Farm	East Hardwick	No Number
Devino Brothers Farm	Milton	No Number
Ethan Allen Farm	South Burlington	No Number
Fontaine Farm	Williston	No Number
Hall-O-View Farm	Charlotte	No Number
Johnson Farm	Canaan	No Number
Town and Roberts Family Farm	Milton	No Number
Rene J. Fournier & Sons Farm, Inc.	West Swanton	No Number
Spring Valley Farm	Enosburg Falls	No Number
Windfall Acres	Highgate Center	No Number
Windy Acres Farm	Swanton	No Number
Clement Rainville	Franklin	No Number
Greenwoods Farm	Alburg	No Number
Islandacre LLC	South Hero	No Number
Meadow Brook Acres	Milton	No Number
Harvey Farm	Florence	No Number
Woodstock Water Buffalo Co.	Woodstock	Moved to Canada

Appendix E: Survey and Interview Data

1. Middlebury Green Energy Expo Survey Data

Participant	Issue										Support
	1	2	3	4	5	6	7	8	9	10	
Solar Developer	3	5	5	5	4	4	3	4	2	4	Yes
VT Resident	4	4	5	5	5	4	5	3	4	4	Yes
VT Resident	2	1	2	3	4	4	5	3	4	3	Maybe
VT Resident	2	5	4	3	4	5	4	4	4	2	Yes
VT Resident	1	5	5	5	5	5	5	4	4	4	
VT Resident	2	3	5	5	3	4	5	5	2	4	No
VT Resident	1	3	5	5	5	5	4	0	0	5	Yes
VT Resident	5	5	5	5	4	5	5	5			
VT Resident	3	4	4	4	3	4	0	0	3	4	Yes
VT Resident	3	5	5	5	2	3	5	3	4	4	Maybe
VT Resident	5	4	5	4	5	5	0	5	0	0	Yes
VT Resident	2	2	2	3	2	3	4	3	4	4	Maybe
VT Resident	2	4	5	5	5	5	3	4	5	4	Maybe
VT Resident	2	0	4	4	4	0	0	0	4	3	Maybe
VT Resident	2	2	5	5	3	4	2	3	4	3	Yes
VT Resident	2	5	5	3	5	3	5	4			Yes
VT Resident	3	4	4	4	4	4	4	4	4	4	Yes
VT Resident	3	4	3	3	4	4	5	3	2	5	Maybe
VT Resident	3	1	5	5	5	5	5	0	4	3	Yes
VT Resident	1	3	3	4	5	5	5	5	5	3	Yes
VT Resident	5	3	5	5	5	5	0	4	4	0	Yes
VT Resident	1	4	4	4	4	4	4	3	4	5	Yes
VT Resident	3	4	4	4	3	3	2	2	3	4	Yes
Farmer	4	4	4	4	4	4	5	4	1		Yes
Farmer	2	2	5	5	5	4	5	5	4	5	Yes
Farmer	3	3	5	5	5	3	3	3	3	5	

2. Farm Identification Corresponding to Phone Interview Data

ID	Farm Name	Location	Representative
1	Kaiser Family Farm	Stowe	Scheuermann
2	Keewaydin Farm	Stowe	Scheuermann
3	Harkdale Farm Inc.	Newbury	Steven
4	Howvale Farm	Tunbridge	Ainsworth
5	Liberty Hill Farm	Rochester	Haas
6	Pearlmont Farm	Barnet	Larocque
7	Cher-Mi Farm	Orwell	Stevens
8	Glen-Mar Dairy	Castleton	William and Helm
9	Dunstable Farm	Cabot	Toll
10	Gervais Family Farm	Enosburg Falls	Perley
11	Blue Ledge Farm	Salisbury	Jewett
12	Crawford Family Farm	Whiting	Stevens
13	Blue Spruce Farm, Inc.	Bridport	Bray
14	Foster Brothers Dairy	Middlebury	Maier and Nuovo
15	Rainbow's Edge Farm	East Burke	Crawford and Lawrence
16	Taylor Farm	Londonderry	Olsen
17	Simplicity Farm	Waitsfield	Greshin
18	Russo Farm	Brunswick	Peaslee
19	Stony Pond Farm	Fairfield	Dickinson and Howringan
20	Monument Farms Dairy	Weybridge	Bray

Appendix F: Definitions of Dairy Farm and Dairy Farmer under H.518

1. Definition of “dairy farm” used in H-518 as defined in statutes 6 V.S.A. § 2672(5):

5) “Milk handler” or “handler” is a person, firm, unincorporated association or corporation engaged in the business of buying, selling, assembling, packaging, or processing milk or other dairy products, for sale within or without the state of Vermont.

2. Definition of “farmer” used in H-518 as defined in statutes 32 V.S.A. § 3752(7):

7) “Farmer” means a person:

(A) who earns at least one-half of the farmer’s annual gross income from the business of farming as that term is defined in Regulation 1.175-3 issued under the Internal Revenue Code of 1986; or

(B) (i) who produces farm crops that are processed in a farm facility situated on land enrolled by the farmer in a use value appraisal program or on a housesite adjoining the enrolled land;

(ii) whose gross income from the sale of the processed farm products pursuant to subdivision (i) of this subdivision (B), when added to other gross income from the business of farming as used in subdivision (A) of this subdivision (7), equals at least one-half of the farmer’s annual gross income; and

(iii) who produces on the farm a minimum of 75 percent of the farm crops processed in the farm facility;

(C) The agency of agriculture, food and markets shall assist the director in making determinations of eligibility pursuant to subdivision (B) of this subdivision (7).

Appendix G: Conference Call Between Jim Crawford of Crawford Family Farm and Chad Farrell of Encore Redevelopment

1. Transcript

Interviewer: What are the perks of the SPEED program for the solar developer and what are the perks of the SPEED program deal for the dairy farmers?

Ferrell: The SPEED program itself benefits the farmer through a lease payment, but there is no net-metering. The electricity is dumped back into the grid. Net-metering is a program where the farmer could benefit by receiving a low cost of electricity over 25 years. Those are generally much smaller arrays. [As far as the SPEED program] To get any investors interested you would have to get at least a 1 MW, and that is going to cost the farmer about 8-10 acres of land. Depending on Jim's electric load, this could be a more attractive option. We have experience working with both the SPEED program and the net-metering program. But the net metering window is closing just because it is fully tax incentivized right now, the Vermont business solar tax incentive is set to decrease from 30% of total project cost to 7.2% in December 31st. So time is of the essence.

The legislation that your talking about is going to take time, the public service board is going to need to get involved and issue a bunch of orders if it's similar to the SPEED program from last year, we had new legislation out in May but we didn't have the program until late October. With all of that said I will sit back and try to answer whatever questions you have. If you do want to do a net-metering project we are offering turn key development services for those projects right now, so it could dove-tail nicely with the projects that we're doing right now.

Crawford: I've looked into net-metering and it does seem like a good way to secure what your electric rates are going to be over a long period of time, but with this particular bill and with this SPEED program I thought it would be interesting to increase a little cash flow, and if it's feasible for me to dedicate 10 acres of land then I would be interested in the bill. I have access to three phase power and good southerly exposure, so I think that my property would be a good site. I have 300 acres on my farm, and to dedicate 10 acres of that for a contract over a long period of time knowing that that would generate some revenue, it could be done very easily from my perspective at this point. The net-metering was very interesting to me but, considering economies of scale, I figure that the costs per kW for infrastructure must drop significantly with the larger projects.

We were modeling \$4.50/watt. So it's now a \$4.6 million project for 1 MW. The maximum capacity for net metering deals are 250 kW, but we are advocating 100 kW as maximum in order to avoid the overly cumbersome 248 permitting process. If you stay under 150 kW then you don't have to go through that entire process, the two page application and 45 day decision. So, absolutely and those price per kW deals were \$5.50 to \$6, so you can see that there is an economy of scale for sure. The problem with the utility scale, is that \$0.24 is not going to cut it in absence of the tax break.

Interviewer: Under the current SPEED program I believe that the rate is 30 cents a kW. And this amendment will be the same as the current SPEED program.

Ferrell: That \$0.30 was just an interim price standard and the true 2 year interim price standard is \$0.24. And when you get that it assumes that the utility is going to get the real energy

credits. So here's my take, \$0.30 is still pretty difficult. And in the \$0.30 deals that are going on now, you are still able to get the Vermont business solar tax credit, and the fact that the state drops the rate to \$0.24 and the tax credit is dropping from 30% to 7%, is going to make any project extremely economically challenging

Crawford: My question as far as net-metering is that with net metering, I can look at my bill and or any residential bill and with Central Vermont Public Service I'm paying \$0.14/kW, and to put up an investment even for net-metering for my own personal consumption the pay back is so long, we're talking 25 years right?

Ferrell: No, you would be well positioned to take the Rural Energy for America program grant which is 25% of total project cost and if you were to bring tax equity into the deal, then you get 30% from the federal 30% from the state, and you've got 85% of the project cost gone in the form of a grant and or tax credit. If you can't do the tax equity then you can still do the REAP grant, and do the Treasury grant in lieu of tax credits provided that the system is in place and functioning by December 31st, and that is 30%. The home run deal is being able to provide the Vermont and Federal tax credit equity and getting the REAP grant, and the 150 kW system is about an \$800,000 deal, and you take 85% of that off and see what you've got left, provided that you've got the tax equity. And if you don't we might be able to help you source that.

Crawford: So explain the tax equity to me.

Ferrell: There are a number of higher net worth individuals out there that will take and sell you their tax equity to gain a return. You pay them a percentage for that and they would contribute that tax equity in exchange for a return.

Crawford: Is this a typical process?

Ferrell: It is fairly typical, but it can be difficult to find the tax equity partner. The other option that is popular is a power purchase agreement model. In this system, you provide the acres of land for the system; you utilize the group metering benefits that you produce; you pay a flat fee to access that levelized cost of electricity and we assemble a group of investors to essentially own and operate the system and after the tax credit has been appreciated then there is an opportunity for you to purchase the system at fair market value which after 7 years is about 25% of the install cost. Then that gives you about a 5 year payback and then you've got free electricity for the remainder of the life of the system, free power. The panels are warranted for about 25 years, they lose about 0.5% efficiency per year.

Crawford: how often does infrastructure need to be replaced.

Ferrell: Inverters need to be replaced about once every 10 years, so what we do in our model is carry an annual budget for operation costs.

Crawford: Extra electricity that I produce will be lost, is that correct?

Ferrell: Yes, if you are in CVPS then certainly. If you were in Green Mountain Power they would allow you to sell the extra the electricity that you produce.

Crawford: Would it be possible for me to sell extra electricity to neighbors in my group net metering area?

Ferrell: Yes. You would have to be the aggregator, there are some accounting requirements, but people are certainly doing it. I would suggest finding 2-3 other users not 8-10 to reduce complications.

Crawford: Because again, the economies of scale makes me want to produce more. But I am also considering the difficulty of permitting for projects over 150 kW that you mentioned.

Ferrell: Write this down. A 150 kW array in Vermont is going to generate 160,000 kW hours per year. So you just need to look at your utility bills and figure out what you use in a year and try to aggregate a system of users to make up that 160,000 kW hours.

Crawford: How many acres would that be?

Ferrell: About 1 1/2 acres at most.

Crawford: Would I have to go through the backside of a meter? Or do I just feed back into the grid?

Ferrell: It will have to be metered so that you can tell how much you're feeding into the grid, and we would just have to dedicate what ever amount of power to the recipients that you elect. And those meters would have to be 2 way meters.

Interviewer: As it stands right now , is the permitting process for the developer prohibitive in terms of developing larger arrays, or is it more circumstantial.

Ferrell: It is currently prohibitive, but H.781 intends to streamline the process. A 2.2 MW project is about \$10 million but it is still a relatively small project in comparison to the rules and regulations which are intended to cover a project from everything from 2.2 MW to Vermont Yankee. I have heard from a number of folks who have received a subsidy from the original SPEED program and they have said that the permitting costs are way out of proportion to the project size.

Interviewer: If you were developing the 2.2 MW array, would economies of scale make the project more appealing than the smaller projects.

Ferrell: Relative infrastructure costs would indeed be reduced.

Interviewer: If the permitting process was to be streamlined, what are the trade offs between the smaller net-metering projects and the larger 2.2 MW SPEED program projects?

Ferrell: I would not do the 2.2 MW SPEED program at the \$0.24/kW rate. This will be the rate from now until 2012. A 1 MW solar array at \$0.24 is going to generate, a gross revenue of \$250,000/year, before

operating cost and taxes and all that stuff. If you were going to own the system then you would get that rate. The benefit for Jim would be a lease payment that would be probably 3-5% of gross payment annually, then Jim would be getting about \$12,500/year over 25 years. So basically \$1,000/acre for those 10 acres. But for the 2 MW array is going to be about double that rate and take up 1- 20 acres. So to give you a general idea, it's going to be \$1,000-2,000/month in lease payments.

Crawford: From my perspective, the net-metering and any options to secure what your costs are going to be, or to make it a more sustainable operation so you're not reliant on the power companies and the fluctuations of the power rates, if it all works out economically, the project seems very interesting to me. I understand that even with a larger 10 acre project, you're not going to be able to quit your job, but it would be a nice extra source of revenue. But if the \$0.30 drops significantly its not going to make much sense for any one.

Ferrell: No, its not. And the \$0.30 has already dropped to \$0.24. On top of that, for a \$4.6 million project for a 1MW solar project, then you are looking for \$1.5 million in tax equity. There aren't that many entities in Vermont that have that kind of tax liability. So the only way to make these deals work at \$0.30 is to have the tax equity in there. Just for reference, Ontario has a feed-in tariff system, very similar, and they are paying the equivalent of \$0.45, Germany is paying \$0.60, the UK is paying \$0.48. When you have higher numbers like that then you don't need the tax equity. So it's really a much easier deal in those places. Other states in the U.S. have a market based renewable energy incentive. Where they create a little market for renewable energy credits. Vermont has a renewable portfolio goal, we don't have a standard. Every other state in New England has what is called a renewable portfolio standard. That means that the utilities by law are required to achieve a certain percentage of clean renewable energy. If they don't make that percentage then they have to make an alternative compliance payment. And if the compliance payment is high enough then the utility wants to buy the renewable energy credits that are just a little less than the compliance payment. It's a market driven strategy. It's what Massachusetts, Rhode Island, and New Jersey do. Vermont decided to stick with the goal instead of going to the standard, which I think is unfortunate. Massachusetts has a pretty average program, but we still haven't even gotten there yet. Our system is prized because the state says that the cost is born on the rate payer. Which is why you want to do anything that you can do now to lock in a levelized cost of electricity; the department of public service, which is a pretty conservative entity, they are saying that in 10 years we are looking at north of \$0.20. So if you make an investment which provides a levelized cost of electricity, just looking at 2010 rates, in 20 years you are going to be looking pretty smart. I haven't talked with one person who thinks that rates are going down. Obviously you should do everything that you can do to achieve efficiency on the demand side. But on the supply side, it's all about trying to lock in the hedge against these increasing rates.

Interviewer: So, as I previously mentioned, we are trying to develop a very specific profile of Jim's farm and his prospects for solar development, so if we were able to provide you with some more concrete figures, do you think that you could provide us with a more specific idea about what solar development on Jim's farm would look like?

Ferrell: It's going to be tough in the next couple of weeks here. We are going bonkers on all of these net metering projects. I'm just being brutally honest with you. I think we could probably help you but we really need to focus on all the time and money that we've spent trying to get to this point. We need to have the certificate of public good filled out by July 15th in order to access the Vermont Business Solar Tax credit. And in order to get the credit we have to educate the land owners to get

comfortable enough to get into the deal and pay for the feasibility study. And if it's feasible then we submit the CPG application. And I'm not independently wealthy to be brutally honest and we've taken a huge amount of risks to get to this point and we need to be focused like a razor to get as many of these projects up and running by June 1st. I'd be happy to run some pro-formas for you guys but I really can't spend more than a couple hours on this.

Interviewer: No worries, you have already helped us more than you can imagine.

Ferrell: Okay, keep me in the loop.